

National Adhering Organizations and Delegates Attending the 51<sup>st</sup> IUPAC Council Meeting  
Virtual 15-20 August 2021

**Australia**

*Australian Academy of Science*

Prof. Frances Separovic  
Prof. David Black  
Prof. Lori Ferrins  
Prof. Marina Stenzel  
Prof. Mary Garson

**Austria**

*Austrian Academy of Sciences*

Prof. Dr. Ulrich Schubert

**Bangladesh**

*Bangladesh Chemical Society*

Mr. Md. Abdul Karim  
Dr. Md. Iqbal Rouf Mamun

**Belgium**

*The Royal Academies for  
Sciences and the Arts of  
Belgium (RASAB)*

Dr. Paul Baekelmans  
Dr. Rita Cornelis

**Bulgaria**

*Bulgarian Academy of Sciences*

Prof. Vessela Tsakova

**Canada**

*National Research Council Canada*

Prof. Francesca Kerton  
Dr. Homin Shin  
Dr. Dajana Vuckovic  
Dr. Jennifer van Wijngaarden

**Chile**

*Sociedad Chilena de Química*

Dr. Eduardo Pereira  
Dr. Adelio Matamala

**China**

*Chinese Chemical Society*

Prof. Zhigang Shuai  
Prof. Qinghua Fan  
Prof. Shuli You  
Dr. Suping Zheng  
Dr. Lidong Han

*Chemical Society Located in  
Taipei, China*

Prof. Yi-Chou Tsai  
Pres. Fan Chen Lee  
Prof. Yong-Chien Ling  
Prof. Tun-Cheng Chien  
Prof. Jiun-Tai Chen  
Dr. Ito Chao

**Costa Rica**

*LANOTEC-CeNAT*

Dr. José Roberto Baudrit  
Dr. Andrea Araya Sibaja

**Croatia**

*Croatian Chemical Society*

Prof. Vladislav Tomišić

**Czech Republic**

*Czech Chemical Society*

Prof. Dr. Jiří Vohlídal  
Prof. Jan Merna  
Prof. Jiri Barek  
Ms. Michaela Smetanova

**Denmark**

*Det Kongelige Danske  
Videnskaernes Selskab*

Dr. Michael Brorson

**Egypt**

*Egyptian Committee of Pure and  
Applied Chemistry*

Dr. Kamal Aly  
Prof. Nadia Kandile  
Prof. Ghada Bassioni  
Dr. Osama Marzouk

**Finland**

*Finnish Chemical Society*

Prof. Anu Airaksinen

**France**

*France Comité National de la  
Chimie*

Dr. Stanislas Pommeret  
Dr. Patrick Maestro  
Mr. Jean Pelin  
Prof. Jean-Pierre Vairon  
Prof. Robert Guillaumont  
Prof. Clément Sanchez  
Prof. Nicole Moreau

**Germany**

*Germany Deutscher*

*Zentralausschuss fuer Chemie*

Dr. Hans-Georg Weinig  
Dr. Wolfram Koch  
Prof. Dr. David-Samuel Di Fuccia

**Greece**

*Association of Greek Chemists*

Dr. Athanasios Papadopoulos

**Hungary**

*Hungarian Academy of Sciences*

Dr. Attila Csaszar

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**India**

*Indian National Science Academy*

Prof. Vinod K. Singh  
Prof. Hirenda N. Ghosh  
Prof. Ayyappanpillai Ajayaghosh  
Prof. Srinivasan Natarajan  
Prof. Sandeep Verma

**Ireland**

*Royal Irish Academy*

Prof. Sylvia Draper

**Israel**

*Israel Academy of Sciences  
and Humanities*

Prof. Ehud Keinan  
Prof. Micha Fridman  
Prof. Meital Reches  
Prof. Doron Shabat  
Prof. Ofer Reany

**Italy**

*Consiglio Nazionale delle Ricerche*

Dr. Maurizio Peruzzini  
Prof. Lidia Armelao  
Prof. Angela Agostiano  
Dr. Matteo Guidotti  
Dr. Alessandra Sanson  
Dr. Silvia Borsacchi  
Dr. Maria Augusta Paci

**Jamaica**

*Caribbean Academy of Sciences,  
Jamaica*

Dr. Marvadeen Singh-Wilmot

**Japan**

*Science Council of Japan*

Prof. Hiroko Tokoro  
Prof. Ken Sakai  
Prof. Takae Takeuchi  
Prof. Makoto Yamashita  
Prof. Chiharu Tokoro  
Prof. Kishimura Akihiro  
Dr. Tsuneyuki Yamane

**Jordan**

*Jordanian Chemical Society*

Prof. Raed Ghanem  
Prof. Abeer Fayez Al-Bawab  
D. Fadwa Odeh

**Kazakhstan**

*B.A. Beremzhanov Kazakhstan  
Chemical Society (RPA "KChS")*

\*Prof. Mukhambetkali Burkitbayev

**Korea, Republic of**

*Korean Chemical Society*

Prof. Ok-Sang Jung  
Prof. Seokmin Shin  
Prof. Nak Cheon Jeong  
Prof. Mi Hee Lim  
Prof. Eunsung Lee  
Prof. Myung-Han Yoon  
Ms. Myeong-Sook Kim

**Kuwait**

*Kuwait Chemical Society*

Mrs. Khalda Aldalama  
Mrs. Huda Alnassar

**Malaysia**

*Institut Kimia Malaysia*

Dr. Ting Keuh Soon  
Dr. Zuriati Zakaria  
Prof. Chin Han Chan  
Dr. Aqeel Saravanan

**Nepal**

*Nepal Polymer Institute*

Dr. Rajesh Pandit  
Prof. Dr. Rameshwar Adhikari

**Netherlands**

*Koninklijke Nederlandse  
Chemische Vereniging*

Mr. Jan-Willem Toering  
Prof. Dr. Floris Rutjes  
Prof. Dr. Jan Reedijk  
Prof. Dr. Jan Apotheker  
Mr. Maarten van Sisseren

**New Zealand**

*Royal Society Te Apārangi*  
Prof. Geoffrey Waterhouse

**Nigeria**

*Chemical Society of Nigeria*  
Dr. Sunday Okeniyi

**Norway**

*Norwegian Chemical Society*  
Prof. Leiv Sydnes  
Prof. Harald Walderhaug  
Dr. Hege Karlsen  
Prof. Stian Svelle

**Poland**

*Polish Academy of Sciences  
Committee of Chemistry*  
Prof. Janusz Jurczak  
Prof. Pawel Kulesza

\*Observer

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**Portugal**

*Sociedade Portuguesa de Química*

Prof. Artur Silva  
Prof. Joaquim Faria  
Prof. Adelino Galvao  
Prof. Ana Aguiar-Ricardo

**Puerto Rico**

*Colegio de Químicos de Puerto Rico*

Prof. Ethel Rios  
Dr. Jose Prieto  
Prof. Jorge Colón  
Prof. Néstor Carballeira

**Russia**

*Russian Academy of Sciences*

Prof. Michail Egorov  
Prof. Petr Fedotov  
Prof. Nikolay Nifantiev  
Prof. Anna Makarova  
Prof. Natalia Tarasova  
Prof. Eketerina Lokteva

**Senegal**

*Comité Sénégalais pour la Chimie*

Prof. Serigne Amadou Ndiaye  
Prof. Modou Fall

**Serbia**

*Serbian Chemical Society*

Prof. Slavica Ražić

**Singapore**

*Singapore National Institute of Chemistry*

Dr. Xianjun Loh  
Prof. Thomas Walczyk

**Slovakia**

*Slovak National Committee of IUPAC*

Assoc. Prof. Milan Drábik  
Prof. Jan Labuda  
Dr. Igor Lacík

**Slovenia**

*Slovenian Chemical Society*

Prof. Dr. Venčeslav Kaučič

**South Africa**

*National Research Foundation*

Prof. Peter Mallon  
Prof. Marietjie Potgieter  
Prof. Willem van Otterlo

**Spain**

*Real Sociedad Española de Química*

Prof. M. Concepción Gimeno  
Prof. Ernesto de Jesus

**Sri Lanka**

*Institute of Chemistry Ceylon*

Prof. Srianthie Deraniyagala  
Prof. Ramanee Wijesekera

**Sweden**

*Swedish National Committee for Chemistry*

Prof. Lars Öhrström

**Switzerland**

*Swiss Academy of Sciences*

Dr. Leo Merz  
Prof. Dr. Catherine Housecroft  
Prof. Dr. Christophe Copere

**Thailand**

*Department of Science Service*

Dr. Wandee Luesaiwong  
Prof. Dr. Supa Hannongbua  
Prof. Dr. Supawan Tantayanont  
Dr. Amornpon Changsuphan

**Turkey**

*Turkish Chemical Society*

Prof. Dr. Mustafa Sozbilir  
Prof. Dr. Bahattin Yalcin  
Assoc. Prof. Dr. Onder Metin

**United Kingdom**

*Royal Society of Chemistry*

Dr. Sarah Thomas  
Prof. Hemda Garelick  
Prof. Paul Topham  
Prof. Gerry Moss  
Prof. Jeremy Frey  
Dr. Alejandra Palermo

**United States**

*National Academy of Sciences*

Dr. Daniel Rabinovich  
Ms. Bonnie Lawlor  
Dr. Laura McConnell  
Dr. Raychelle Burks  
Dr. Danniebelle Haase  
Dr. Lewis Whitehead  
Dr. Liana Vaccari

**Uruguay**

*Pedeciba Química*

Ms. Gloria Serra  
Dr. Leopoldo Suescun  
Dr. Carmen Rossini  
Dr. Lucia Pareja  
Dr. Veronica Cesio

NAO	2021 Votes	
China/Beijing	6	6
Germany	6	12
Japan	6	18
Korea, Republic of	6	24
United States	6	30
China/Taipei	5	35
France	5	40
India	5	45
Italy	5	50
Netherlands	5	55
Russia	5	60
Spain	5	65
United Kingdom	5	70
Australia	4	74
Belgium	4	78
Canada	4	82
Israel	4	86
Poland	4	90
Singapore	4	94
Switzerland	4	98
Austria	3	101
Chile*	0	101
Czech Republic	3	104
Finland	3	107
Ireland	3	110
Malaysia	3	113
Norway	3	116
Portugal	3	119
Puerto Rico	3	122
South Africa	3	125
Sweden	3	128
Thailand	3	131
Turkey*	0	131

NAO	2021 Votes	
Bulgaria	2	133
Denmark	2	135
Greece	2	137
Hungary	2	139
New Zealand	2	141
Slovakia	2	143
Slovenia	2	145
Bangladesh	1	146
Costa Rica	1	147
Croatia	1	148
Egypt	1	149
Jamaica	1	150
Jordan*	0	150
Kuwait	1	151
<i>Mozambique</i>	0	151
Nepal	1	152
Nigeria	1	153
Senegal	1	154
Serbia	1	155
Sri Lanka	1	156
Uruguay	1	157
158		

\* Not eligible to vote (05 August 2021)

Votes	#NAOs
6	5
5	8
4	7
3	11
2	7
1	12
0	4
Majority	80
75%	118
66.60%	105



INTERNATIONAL UNION OF  
PURE AND APPLIED CHEMISTRY

**51<sup>st</sup> IUPAC COUNCIL MEETING**  
**Virtual 05<sup>th</sup>, 13<sup>th</sup> through 15<sup>th</sup> August 2021**  
**FINAL DETAILED AGENDA**

Opening of the 51<sup>st</sup> Council Meeting – Thursday 5<sup>th</sup> August 2021 08:00 – 09:30 EDT (UTC-4)

1. [08:00] Introductory Remarks and Finalization of Agenda  
[Prof. Brett]  
[For Information]
2. [08:20] Approval of Minutes of 50<sup>th</sup> Council Meeting and Matters Arising  
[Prof. Brett]  
[For Information and Decision by Delegation]

The draft minutes of the 50<sup>th</sup> Council meeting are in the Agenda book for review.

**Motion:** *Minutes of 50<sup>th</sup> Council Meeting in Paris, France are approved.*

3. [08:30] Ratification of Decisions Taken by Bureau and Executive Committee since 50<sup>th</sup> General Assembly  
[Prof. Brett]  
[For Information and Decision by Delegation]

All decisions taken by the Bureau and Executive Committee through calendar year 2020, since those approved by the Council at Paris, France (Minute 3, 50<sup>th</sup> Meeting), are contained in the following Minutes, which were distributed to National Adhering Organizations on the dates shown:

104<sup>th</sup> Bureau (Virtual, 25<sup>th</sup> April 2020) DRAFT

103<sup>rd</sup> Bureau (Paris, France, 9<sup>th</sup> and 12<sup>th</sup> July 2019)

159<sup>th</sup> Executive Committee (Virtual, 10<sup>th</sup> November 2020)

158<sup>th</sup> Executive Committee (Tokyo, Japan, 6<sup>th</sup> December 2019)

**A summary of the decisions taken is in the Agenda Book with the minutes.**

**Motion:** *Council ratifies all decisions taken by the Bureau and Executive Committee through calendar year 2020, since those approved by the Council at Paris, France (Minute 3, 50<sup>th</sup> Meeting).*

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4. [08:45] Announcement of Nominations for Union Officers and Bureau Members

[Prof. Hartshorn]

[For information]

According to Statute 5.401, Council must elect (1) Officers of the Union and (2) Elected Members of the Bureau at its upcoming meeting. 51<sup>st</sup> Virtual 2021.

According to Bylaw 2.221, nominations are due at least two months prior to the beginning of the Council at which the elections will take place.

The nominations for the various positions that fall vacant at the end of 2021 were received by the Secretary General at the IUPAC Secretariat by 15 May 2021.

**Elected Members of Bureau: Four/Five Vacancies**

The Bureau consists of the Officers, the eight Division Presidents, six Standing Committee Chairs and no less than ten other members elected by Council, who are known as “Elected Members”. Elected Members serve a four-year term. No National Adhering Organization shall have more than one Elected Member on the Bureau. The statute also states that: “the principle of fair geographical representation of Members shall be taken into account”.

At the conclusion of the 50<sup>th</sup> Council in Paris, there were ten Elected Members on the Bureau. At the 51<sup>st</sup> Council held Virtually, the Bureau will make recommendations to Council as to the number of Elected Members (ten or more) who should be on the Bureau for the succeeding two years. At least four Elected Members will be elected at the 51<sup>st</sup> Council, i.e., the minimum number of ten Elected Members less the six Elected Members who continue in office until 2021.

The nominees’ CV’s, Biographies, Photos and Vice President’s Statements may be found in the Agenda Book.

*4.1 Candidates for Vice President*

Prof. Mary Garson (Australia)

Prof. Ehud Keinan (Israel)

Dr. Ting-Kueh Soon (Malaysia)

Prof. Supawan Tantayanon (Thailand)

*4.2 Candidates for Treasurer*

Prof. Russell Boyd (Canada)

Prof. Wolfram Koch (Germany)

*4.3 Candidates for Member of Bureau (continued on page 3)*

Prof. Abeer Al Bawab (Jordan)

Prof. Hemda Garelick (United Kingdom)

Dr. Ting-Kueh Soon (Malaysia)

Dr. Patrick Maestro (France)

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Dr. Laura McConnell (United States)  
Dr. Zoltan Mester (Canada)  
Prof. Greg Russell (New Zealand)  
Prof. Ken Sakai (Japan) 2<sup>nd</sup> Term  
Prof. Zhigang Shuai (China/Beijing)  
Prof. Supawan Tantayanon (Thailand)  
Prof. Pietro Tundo (Italy)

**Note:** If any Elected Members of Bureau who are continuing, or any candidates for Bureau, are elected to a position as Officer, Division President, or Standing Committee Chair, they are not eligible to continue or to be elected to the Bureau at this election for the 2022-2023 biennium. Should that occur, there may be additional elected positions to be filled.

5. [09:00] Announcement of Time of Elections and Description of Procedure

[Prof. Hartshorn]  
[For information]

The elections for Vice President and Treasurer and Elected Members of the Bureau will begin at **09:45** hours on 5<sup>th</sup> August 2021.

6. [09:15] Applications for National Adhering Organization Status (NAO)

[Prof. Hartshorn]  
[For information and Decision by Delegations]

There is one application for National Adhering Organization status.

6.1 Kazakhstan: The Republican public association “B.A. Beremzhanov Kazakhstan Chemical Society (RPA “KChS”) has applied to become a National Adhering Organization of IUPAC. The application and supporting documents are in the Agenda Book for review. Bureau has reviewed the application material and recommended their application be put forth to Council. Their National Subscription has been calculated using the new model approved by Council in 2018. The 2022 subscription will be \$1,000 and if approved by Council, they will be entitled to cast 1 vote. Prof. Mukhambetkali Burkitbayev is the Chairman of the Board of the RPA “KChS”.

**Motion:** *Council approves the Kazakhstan: Republican public association “B.A. Beremzhanov Kazakhstan Chemical Society (RPA “KChS”) as a National Adhering Organization effective 1 January 2022.*

**[09:30] Closing of the Opening Session**

Voting opens (Vice President #1, Treasurer)

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**Council Meeting Day 1 - Friday 13<sup>th</sup> August 2021**

08:00 – 11:00 EDT (UTC-4)

7. [08:00] Statutory Report of President on State of the Union

[Prof. Brett]

[For information]

The report will give an overview of the challenges and accomplishments during the last biennium. It includes sections on IUPAC committees and their activities, on governance and virtual meetings of council, conferences, publications and digital standards, legacy activities of the centenary/IYPT and the forthcoming IYBSSD, international organisations, the Centenary Endowment Fund and new standing committees. Further details can be found in later agenda items, the reports from the other officers, from the divisions and from the standing committees. The detailed report is available in the Council Agenda Book.

8. [08:20] Vice President's Critical Assessment

[Prof. Garcia-Martinez]

[For information]

This Vice President's critical assessment examines IUPAC's activities, priorities, and opportunities in the context of changes experienced during the current biennium. It describes the rationale and convenience of the organizational changes proposed by Review Group, which were endorsed by the Executive Committee earlier this year. The need for a more agile decision-making process and clearer scientific priorities are discussed in the light of the surveys conducted by both the Evaluation Committee and the Review Group and of extensive conversations among the Bureau members. This critical assessment discusses the current and future plans to advance the IUPAC digital agenda and to make sure that IUPAC leads the digital space. Finally, it contains specific initiatives to improve our internal and external communication and to better serve our stakeholders and the chemistry community. The Vice President's Critical Assessment report is in the Agenda Book.

9. [08:40] Report of Secretary General

[Prof. Hartshorn]

[For information]

The Secretary General will report on the operation of the Secretariat and on initiatives taken to advance the work of the Union. The report to Council is presented in the Agenda Book.

10. [09:00] Financial Reports

[Mr. Humphris]

[For information]

## 51<sup>st</sup> IUPAC COUNCIL MEETING DETAILED AGENDA

### 10.1. Biennial Report of Treasurer

The 2020/21 biennium is an extraordinary period for IUPAC. The Covid pandemic has meant that IUPAC has had to adjust to functioning virtually. In this regard the proposal to reduce operating budgets for this biennium at the Paris General Assembly to encourage virtual administrative activity, although unpopular, was timely. The organisation has had to learn to operate this way and exploit the advantages this can bring – more regular meetings, less time-consuming travel.

As you would expect travel and subsistence expenditure in 2020 was very low (just \$7,761 v Budget \$292,029) and we can expect to see a significant underspend in 2021 given the virtual Congress and General Assembly. This is not however without its downsides. Bureau has recognised the issues that also result from the lack of face-to-face contact. New project activity is very low and a concern, a point I will return to in the budget proposal.

Allowing for the gains booked for the investment portfolio, the 2020 showed an operating profit of \$222,796 (v budget -\$9003) and we expect 2021 to also show an operating profit given the continuing restrictions arising from the Covid pandemic. It has allowed us to pay off our borrowing. As you will see below the Union's Financial Portfolio has performed strongly (now returned to above \$5m) through the pandemic and current economic rebound.

It is very important however that Council understands however that the current financial performance completely masks the underlying problem that IUPAC has running structural deficits. The biennium 2018/19 showed an operating loss of \$431,047 net of portfolio gains/losses largely funded by borrowing. IUPAC owed \$336,784 on its line of credit in December 2019. The line of credit was designed to help smooth cash flow, not to fund operations and should zero at year end. Regular deficits are unsustainable in the medium to longer term. It is clear that we have to find ways to deliver science relevant to this digital age, in ways that reduce the costs of complexity in the organisation, to demonstrate efficient use of resources to be able to attract funding from new donors.

This is the importance of the current Organisational Review. It is not about organigrams. There is a need to refocus our work on data, nomenclature, and standards in ways that reflect the multidisciplinary nature of the problems facing the world and deliver this more effectively digitally to those who need to use it. It is an opportunity to rethink what we do and how we do it, who we work with and also how we gain value from it.

Council also has the opportunity to approve the proposals for an Endowment Board following approval of Bureau of the boards operational standing orders. A key step in enabling this has been a significant piece of work to correct IUPAC registered tax status in the US following discovery that this was incorrectly registered in the 1950s. Donations can now be tax deductible for those with a taxable presence in the US making it far more attractive to support IUPAC. Individuals can now donate easily through the Guidestar platform (must sign in due to financial disclosures in profiles) here: <https://www.nfggive.com/guidestar/98-6000903> and donations can be available from Amazon purchases (you shop, they donate) through the AmazonSmile program of matched giving in countries where IUPAC is listed as a potential beneficiary.

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It has been a privilege to serve IUPAC as Treasurer and before that as Acting Secretary General. I suspect I will still be around in some capacity remembering that IUPAC is like the Eagles “Hotel California” – you can check in but you can never leave!

### 10.2. Report of Finance Committee

During 2020/21 the Finance Committee met virtually each quarter and with no face-to-face meetings possible. Formal Annual Meetings were held on 9<sup>th</sup> March 2020 on 23<sup>rd</sup> March 2021. The minutes of the FC 2020 meeting are in the Agenda Book and posted on the FC website link: [https://iupac.org/wp-content/uploads/2021/07/FC\\_Approved\\_Minutes\\_Signed\\_23March2021.pdf](https://iupac.org/wp-content/uploads/2021/07/FC_Approved_Minutes_Signed_23March2021.pdf)

During this period it has supported the change of banking arrangements in the USA to SunTrust whilst retaining the services of the Bray Harris Group/R James as preferred financial advisors.

Through its work it recommended a revised policy for Travel and Expenses subsequently approved by Bureau and developed the standing orders for the Endowment Board to ensure clarity for the complementary roles of the new board and the Finance Committee. It has maintained an active management discussion with the financial advisors agreeing adjustments to the portfolio that have enhanced portfolio growth.

The Finance Committee regularly reviewed the financial performance of the Union and received the audits for 2019 and 2020 from the new auditors McMillan Pate & Company. The new auditors have provided useful insights into the financial management of IUPAC whilst giving the annual accounts a clean bill of health. The Audited Financial Statement is in the Agenda Book and also posted in the Finance Committee page at the link: <https://iupac.org/wp-content/uploads/2021/07/2020-IUPAC-Financial-Statements.pdf>.

In March this year the Finance Committee recommended the proposed budget for approval of first Bureau and now to be presented to Council. The Finance Committee however continues to press for a balanced budget.

### 10.3. Accounts for 2019/2020

The full audited accounts for 2019/20 are included in the Agenda Book. Focusing on the surplus of \$222,796 (v budget -\$9003) in 2020, the Profit and Loss key variances were:

- NAO income below plan following the loss of Brazil and Pakistan offsetting the gain of Singapore.
- Growth in income from CA's ahead of budget by \$6500 at \$31,500 – a significant turnaround with scope to improve through increased engagement with industry.
- AMP income from Chemical Societies (Coordinated) is under budget by \$10k and over budget by \$3,300 for direct IUPAC AMP. AMP interest has been slack

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during covid as a key benefit is a discount for IUPAC conferences most of which are being postponed or held virtually.

- Continued pressure on publishing income. With a lack of conference reports steps have been needed to enrich the content of Pure and Applied Chemistry
- Net Interest and Dividends from investments were low and under consideration by the Finance Committee. The Investment Portfolio itself recovered well from the financial downturn in early 2020 rising to \$5.0m for the first time in a number of years.
- Our Secretariat and Administrative costs were in budget overall. General and Administration includes non-secretarial expenses : IT investment for virtual working, project expenditure of \$15.5k, marketing and design costs of \$32k in support of 2019 Centenary legacy projects.
- For the Secretariat it was an exceptionally difficult year for office operations/home working.
- The operating profitability is solely driven however by the lack of Travel and Subsistence expenditure.

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IUPAC Income Statement - 2020 Summary					
		December 2019 Actual	December 2020 Actual	2020 Annual Budget	2020 Actual vs Budget Variance
<b>Income</b>					
Program Income	\$	970,729	\$ 1,088,284	\$ 1,137,691	(49,407)
Direct Public Support		48,019	27,000	36,000	(9,000)
Investments		829,310	723,598	91,000	632,598
Sponsorship Revenue		46,262	(0)	0	(0)
Merchandise Revenue - Pins		249	167	0	167
<b>Total Income</b>		<b>1,894,568</b>	<b>1,839,049</b>	<b>1,264,691</b>	<b>574,358</b>
<b>Gross Profit</b>					
<b>Gross Profit</b>	\$	<b>1,894,568</b>	\$ <b>1,839,049</b>	\$ <b>1,264,691</b>	<b>574,358</b>
<b>Expense</b>					
Awards, Grants & Contribution		46,566	21,955	0	(21,955)
Fixed Costs - Salaries & Benefits		564,327	567,187	614,965	47,778
Lease, Insurance & Bank Fees		93,004	83,780	92,200	8,420
General & Administrative Expenses		135,313	97,818	83,615	(14,203)
Contracted Services		89,854	126,035	98,950	(27,085)
Depreciation Expense		53,010	53,064	52,120	(944)
Other Expenses		29,501	28,479	29,815	1,336
Travel & Meetings		572,870	7,761	292,029	284,268
Miscellaneous Expense		3	(1,948)	0	1,948
<b>Total Expenses</b>	\$	<b>1,584,448</b>	\$ <b>984,132</b>	\$ <b>1,263,694</b>	<b>279,562</b>
<b>Net Ordinary Income / (Loss)</b>	\$	<b>310,121</b>	\$ <b>854,917</b>	\$ <b>997</b>	<b>853,920</b>
<b>Other Income &amp; Expenses</b>					
Other (Income)		(9,985)	(95,643)	0	95,643
Other Expense		15,029	4,166	10,000	5,834
<b>Net Other Income / Expense</b>	\$	<b>5,044</b>	\$ <b>(91,477)</b>	\$ <b>10,000</b>	<b>101,477</b>
<b>Nominal Income / (Loss) for the period</b>	\$	<b>305,078</b>	\$ <b>946,394</b>	\$ <b>(9,003)</b>	<b>955,397</b>

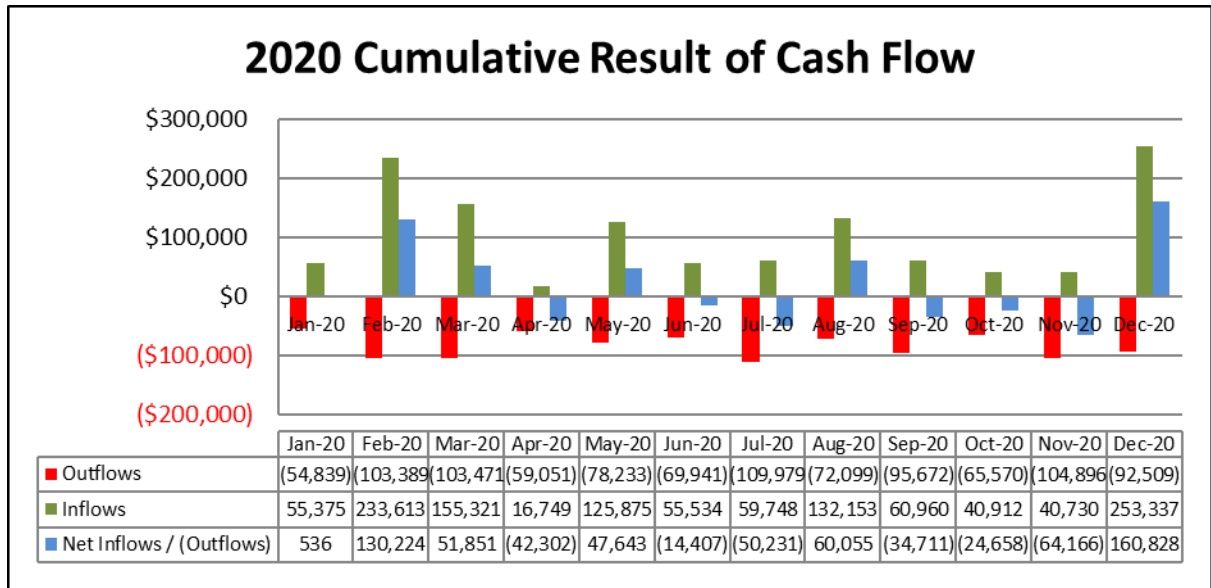
The Balance Sheet shows:

- Healthy end year cash position (\$301k)
- Low receivables compared to previous years.
- A Buoyant investment Portfolio
- The Line of Credit (borrowing) reduced, currently to \$241k. The Line of Credit was set up to help balance cash flows through the year. In recent years it has become permanent borrowing to fund our deficits – not a healthy state of affairs. We aimed to pay this

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borrowing down completely in 2021 and achieved this in May this year. This will maximize flexibility through the next biennium.

- Cash flow benefited from a USA Payroll Protection Loan (\$95,500) which converted to a grant given that we retained all our Secretariat staff.
- The Cash Flow showed the unpredictable nature of our cash inflows and outflows the primary reason for our line of credit:



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IUPAC Audited Balance Sheet				
As of 31 December 2020				
		Dec-19	Dec-20	2019 / 2020 Variance
<b>ASSETS</b>				
Current Assets				
Checking/Savings		314,912	405,672	90,760
Accounts Receivable		2,490	113,355	110,865
Other Current Assets				
Undeposited Funds		313	0	(313)
Sales Tax Receivable		2,588	961	(1,627)
Other Current Receivables		1	0	(1)
Prepaid Expenses				
Prepaid Insurance		1,612	1,704	91
Other Prepaid Expenses		3,960	9,574	5,614
Prepaid General Assembly Exp		0	0	0
Total Prepaid Expenses		5,572	11,278	5,706
Total Other Current Assets		8,475	12,240	3,765
Total Current Assets		325,877	531,267	205,390
Fixed Assets		129,102	87,784	(41,318)
Other Assets				
Security Deposits		3,565	3,565	0
Marketable Securities		4,238,761	4,991,959	753,198
Total Other Assets		4,242,327	4,995,524	753,198
<b>TOTAL ASSETS</b>	\$	<b>4,697,305</b>	\$ <b>5,614,575</b>	\$ <b>917,269</b>
<b>LIABILITIES &amp; EQUITY</b>				
Liabilities				
Current Liabilities				
Accounts Payable		46,863	48,778	1,915
Credit Cards		6,906	13,015	6,109
Other Current Liabilities				
Payroll Liabilities		47,818	54,953	7,135
Unearned Membership Income		65,371	79,406	14,035
Unearned Publication Inc		525	174	(351)
Deferred Rent		11,667	4,702	(6,965)
Short-term Notes Payable		336,784	0	(336,784)
Raymond James Margin Account Loan		0	240,762	240,762
Due to IYCN		5,051	2,490	(2,561)
Other Current Liabilities		22	30	8
Total Other Current Liabilities		467,238	382,517	(84,721)
Total Current Liabilities		521,006	444,310	(76,697)
<b>Total Liabilities</b>		<b>521,006</b>	<b>444,310</b>	<b>(76,697)</b>
Equity				
Net Asset w/ Donor Restriction		204,357	204,357	0
Net Asset w/o Donor Restriction		108,761	120,761	12,000
Unrestricted Net Assets		3,558,103	3,898,753	340,650
Nominal income / (loss) for the period		305,078	946,394	641,316
<b>Total Equity</b>		<b>4,176,299</b>	<b>5,170,265</b>	<b>993,966</b>
<b>TOTAL LIABILITIES &amp; EQUITY</b>	\$	<b>4,697,305</b>	\$ <b>5,614,575</b>	\$ <b>917,269</b>
2020 Audit Figures				

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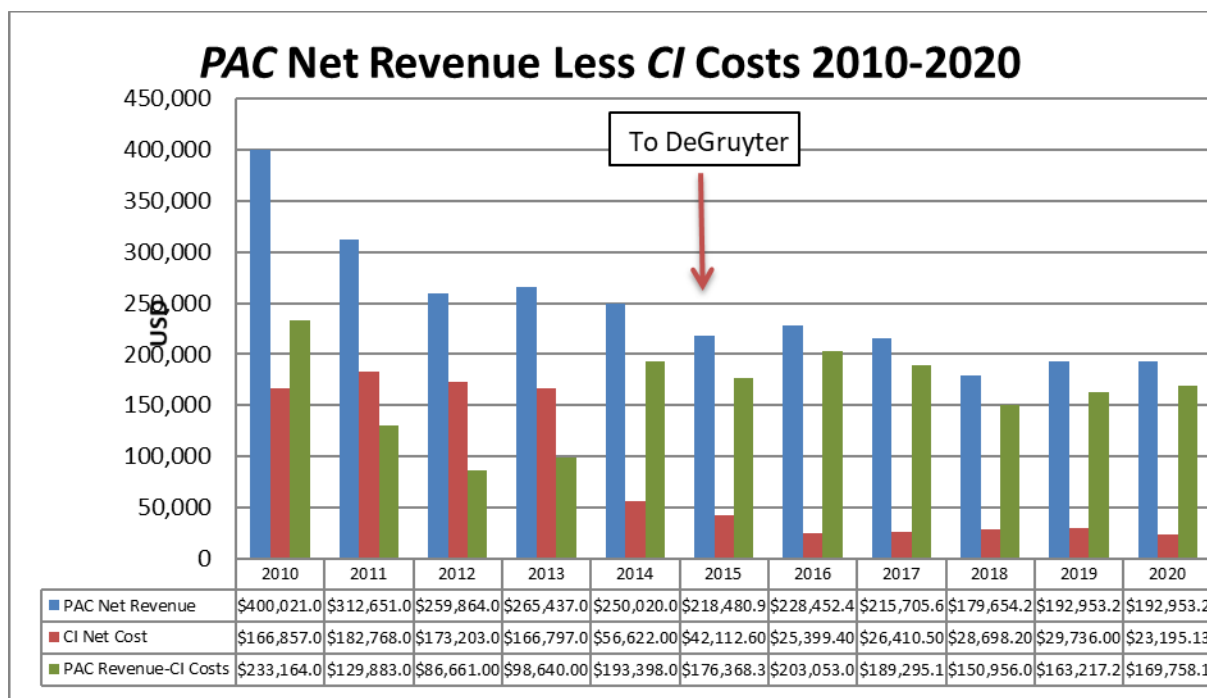
### 10.4. National Adhering Organizations in Arrears

Three National Adhering Organizations have not paid the 2020 National Subscriptions. Together with the Fee Charges to IUPAC, the outstanding amount (Loss) is \$15,225.82.

NAO Country 2020	2020 Paid (USD)	2020 Due (USD)	Loss from Fee Charges
Chile		\$8,229.00	
Jordan		\$1,000.00	
Turkey		\$6,415.00	
<b>Total</b>	<b>\$824,537.82</b>	<b>\$839,612.00</b>	<b>-\$418.18</b>
Budget v. Actual (Loss)		\$15,225.82	

### 10.5. Other Income

Publishing income remains stable but under pressure due to the journal market conditions. The lack of conferences has put pressure on Pure and Applied Chemistry content. From January 2022 Chemistry International will go solely online in a page turning format leaving only costs for design, layout and copy editing remaining. It will be freely available to attract the widest possible global readership. IUPAC is working with De Gruyter to develop CI Digital as a live streaming news magazine.



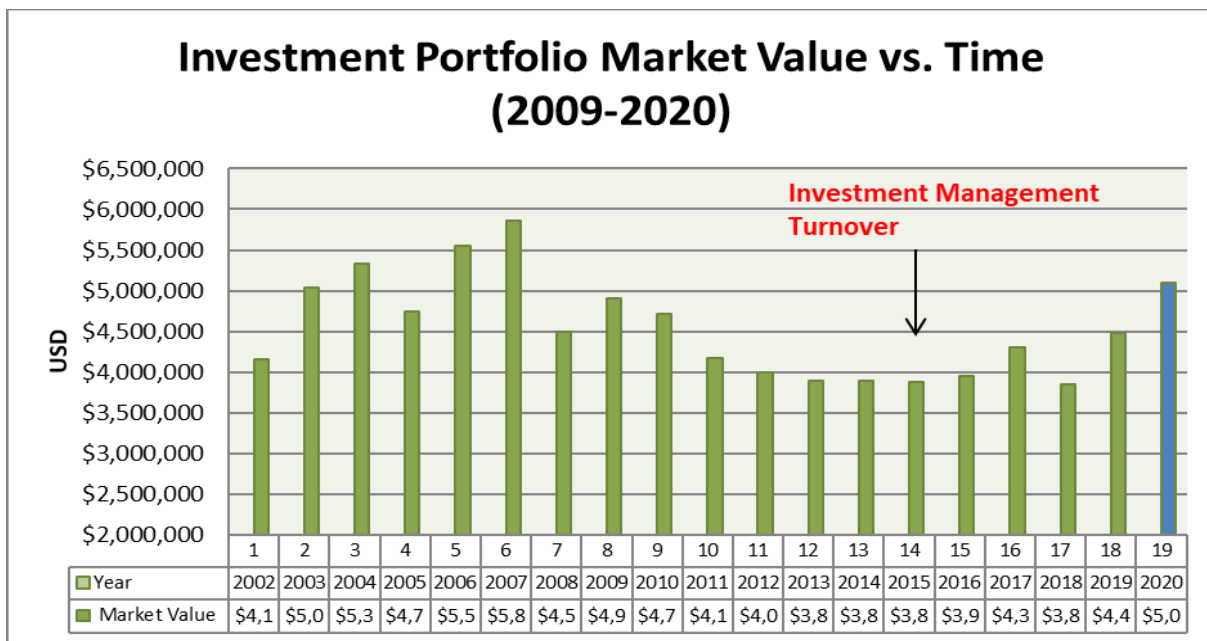
The Affiliate Members Program variance against plan was noted earlier. 2020 was a difficult year for Chemistry Societies promoting this given the key benefit of conference discounts was largely irrelevant in 2020. Membership directly through IUPAC has held up.

For Company Associates, all members now are paying a subscription of \$2500 so income well up from 2017 following the GA decision in Sao Paulo. There is still much work to do to keep members and gain new at a time when companies are focused on pandemic survival.

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## 10.6 Investment Portfolio

The investment portfolio has recovered and is approaching the historic levels back in 2007 as result of active investment management advice from our external advisors. At the end of June 2020, the total market value (MV) was \$5.6M net of fees.



## 11. [09:40] Budget Proposal

[Mr. Humphris]  
[For Approval]

### 11.1. Proposed Budget for 2022-2023

The proposed budget supported by Bureau is shown in the Agenda Book. It shows a deficit of \$265,378 across the biennium based on the following assumptions:

- We emerge from 2021 in a strong cash position with material underspend of 2020/21 budgets.
- NAO subscription income is driven by the current formula with no further membership changes. Company Associate and AMP subscriptions reflect the recent experience.
- We build on the experience of virtual meetings and extend the reduction in operations costs applied to the Divisions 2020/21 and to the Standing Committees.
- We see a return to more 'normal' travel. This is probably an optimistic assumption as the outlook for international travel, future international travel costs and the willingness of the IUPAC community to travel remain highly uncertain.
- Continued pressure on publishing income and the move to CI online and away from print.

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- The organization is unchanged during this biennium by recommendations of the Organization Review. Changes come in the next biennium. Any new committees meet virtually.
- The Netherlands General Assembly 2023 is held face to face but at a more traditional level of cost (The Paris GA included the Centenary and IYPT celebrations).
- Allowance for a CHEMRAWN budget is restored.
- Allowance for a first meeting of the Centenary Endowment Board as it gets underway (the plan is for the board to be self-funding once underway).
- That there will be pressure for the new Bureau and the new Executive Committee to meet in 2022 as this was not possible in 2021.
- We need to budget for a smooth handover of Executive Director position in 2022 as Dr. Soby will be retiring in Q3 2022.
- As a result of the low project activity in 2020/2021 the project budget is spread into 2022. This effectively moves some of the benefit of an underspend in 2021 into 2022.

**Motion:** *Council approves the recommended 2022-2023 Budget*

11.2. National Subscriptions for 2022-2023 (already approved via NSTF 2018)

National subscriptions are shown in the Agenda Book calculated as approved via NSTF 2018. Singapore, approved by Council in 2019 is added to the National Subscription total.

12. [10:00] Establishment of the Centenary Endowment Fund

[Mr. Humphris]

[For Approval by Delegation]

The purpose of the fund will be to finance IUPAC projects and activities in support of:

- The establishment of IUPAC nomenclature and standards in the digital domain to enable advances in Big Data relevant to chemistry and chemistry related research and development,
- IUPAC's unique international role in the critical evaluation of chemical data and establishment of standards that will be necessary to underpin the achievement of Sustainable Development and the UN millennium goals,
- Chemistry Education and Capacity Building in less developed countries to promote their economic development whilst helping to ensure the safe and environmentally sensitive application of chemical technologies in these countries.

The Centenary Endowment Fund will provide a mechanism through which Fund Donors can support and engage in IUPAC's international work into its second century of existence.

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The initial objective of the Fund is to provide endowment investment earnings of at least \$100,000 per annum for IUPAC activities consistent with the Fund Mission, net of the operational costs of the fund. An objective is that the Fund will be self-financing.

The proposal is to create an external board with fund raising experience. The Centenary Endowment Board will be responsible for and will administer IUPAC's funds raising, the development of the Fund and recommending disbursement in accordance with the Fund Mission and, where relevant, specific designations by Donors. The Board will work with the Finance Committee and its advisors to ensure the optimum investment of donated funds.

The Terms of Reference for the Centenary Endowment Board and its modus operandi are attached in the Agenda Book. Council's approval will be sought after which recruitment of directors can commence.

**Motion:** *Council approves the future appointment of the Centenary Endowment Fund Board of Directors including external Directors by the Executive Committee. Council also gives approval to the Executive Committee to progress the formation of the fund and its guiding documents.*

13. [10:20] Bids for and Voting on Location and Dates of 54<sup>th</sup> General Assembly and 51<sup>st</sup> World Chemistry Congress (2027)

[Prof. Hartshorn]

[For Decision; vote by delegations; simple majority (Bylaw B 2.23)]

13.1 [10:30] Canada (Montreal)

13.2 [10:40] Czech Republic-Slovakia (Prague)

13.3 [10:50] Russian Federation (Moscow)

**The bid receiving the majority of votes cast will be deemed selected to host the 2027 WCC/GA.**

**[11:00] Adjourn**

*11:30 Voting for Motions and 2027 Bid Proposals Opens*

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**Council Meeting Day 2 - Saturday 14<sup>th</sup> August 2021**

17:00– 20:00 EDT (UTC-4)

14. [17:00] Organizational Changes in Existing IUPAC Bodies, Proposals for New and Reconstituted Bodies/Terms of Reference

[Prof. Hartshorn]

[For Decision; voting by Delegation]

14.1 Modification to Terms of Reference of ICGCSD

**Proposed Composition and Terms of Office**

- (i) There shall be a standing Interdivisional Committee on Green Chemistry for Sustainable Development, composed of a Chair, a Secretary, up to three Titular Members and up to three Associate Members as a “core” membership, up to eight National Representatives, and one Representative Member from each interested Division and Standing Committee.
- (ii) The President, in consultation with the Executive Committee, shall appoint the Chair, Secretary, Titular Members, Associate Members, and National Representatives. The ICGCSD, Division Presidents and Standing Committee Chairs may propose names of persons suitably qualified for appointment and should conduct elections according to the pattern for Divisions, in order to inform the advice that they give to the President.
- (iii) The period of service of Titular Members, Associate Members and National Representatives shall be two years, renewable for a further term of two years. The period of service of Representatives from the Divisions and Standing Committees shall be two years, subject to re-nomination and reappointment to a maximum period of service of eight years.

**Motion:** *Council approves the proposed modification to the ToR to allow up to 8 National Representatives to the membership of ICGCSD.*

15. [17:10] Composition and Terms of Reference of New Standing Committees

[Prof. Hartshorn]

[For Decision; voting by Delegation]

15.1. Centenary Endowment Board

The Proposed Composition and Terms of Reference of the Centenary Endowment Board, “CEB”, are in the Agenda Book.

**Motion:** *Council approves the Composition and Terms of Reference of the Centenary Endowment Board.*

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15.2. Committee on Ethics, Diversity, Equity and Inclusion

The Proposed Composition and Terms of Reference of the Committee on Ethics, Diversity, Equity and Inclusion are in the Agenda Book.

**Motion:** *Council approves the Composition and Terms of Reference of the Committee on Ethics, Diversity, Equity and Inclusion.*

16. [17:30] Proposals for Changes to the Statutes and By-Laws of the Union

[Prof. Hartshorn]

[For Decision; voting by Delegation]

There were no proposals for Changes to the Statutes and Bylaws received from National Adhering Organizations for changes to the Statutes and By-Laws of the Union.

17. [17:40] Organizational Structure Review Group Report and Actions Taken

[Prof. Brett]

[For Information]

Council approved a motion at the 2019 IUPAC General Assembly that a working group be established to undertake a complete review of the organizational structure of IUPAC. The Organizational Structure Review Group includes Dr. Mark C. Cesa (chair), Prof. Javier Garcia-Martinez (IUPAC Vice President), Prof. Ito Chao, Prof. Dr. Michael Driescher, Prof. Lori Ferrins, and Prof. Zhigang Shuai.

The main objectives were:

- Recommending directions for the scientific work of the union going forward, and how to structure the Union to achieve its scientific objectives.
- Recommending ways of working that would reduce costs and improve efficiency.

The Review Group carried out its extensive work during 2020, which included conducting a wide-ranging survey of stakeholders, of scientific and financial aspects and emerging trends and advances in the chemical sciences. It submitted its report, with 4 appendices, to the Executive Committee in November 2020, who discussed and approved it, and the final report, dated 9<sup>th</sup> December 2020, was circulated to Bureau in December 2020.

In January 2021, two on-line Bureau meetings were held, on 9<sup>th</sup> and 23<sup>rd</sup> January 2021, to discuss the recommendations made in the report and how they could be implemented, if that were the wish of Bureau and decision of Council. It was decided to concentrate on the proposed alterations to governance structure and whether these would lead to greater agility and be effective in adapting and reacting rapidly to change. The Elected Members of Bureau on the one hand, and the Division Presidents (DPs)/Standing Committee Chairs (SCCs) on the other, discussed their points of view between the Bureau Meetings. The proposed change in governance structure involves replacing Bureau with an Executive Board (EB) and a Science Board (SB).

It was necessary to decide in January whether changes to Statutes and Bylaws would be proposed to Council at its meeting in August 2021, since the deadline for receipt of proposals

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for such changes was mid-February 2021. It was concluded that, given the need for extensive internal discussion and consensus within Bureau, that no proposals from Bureau for changes to the Statutes and Bylaws (S&B) regarding governance structure could be made at that time.

The internal discussions, dividing the Bureau into three working Groups, each comprising Elected Members and DPs/SCCs. Following this, the coordinators of the three Working Groups prepared a briefing discussion document regarding alterations to the governance structure that was discussed with Bureau members in videoconferences in June 2021. The final version of the document, together with a cover letter outlining the opinion of the Executive Committee and crucial questions to be considered was sent to Council members in early July 2021. Three videoconference engagement sessions with NAOs have been arranged to take place during the Montreal General Assembly, on 9<sup>th</sup>, 10<sup>th</sup> and 11<sup>th</sup> August at different times of day/night, given the wide span of time zones of NAO delegates. The answers to the important questions on governance structure and composition of the EB and SB etc. and the resulting suggestions will enable a proposal for changes to the Statutes and Bylaws to be formulated and discussed, the final version being ready before the end of 2021.

This proposal for changes to the S&B to implement the new governance structure will then be the basis of a request from the Bureau Chair to the Secretary General to call a Special Council Meeting. Following this request, the President will call a special Council meeting in 2022 in order to vote on the necessary changes to the Statutes and Bylaws.

18. [18:00] Reports of Division Presidents (Written/video reports will be received and 5 minutes allowed for questions and discussion on each)

[Prof. Richard Hartshorn]

[For Information and Discussion]

18.1. Division I – Physical and Biophysical Chemistry	Dr. Timothy Wallington
18.2. Division II – Inorganic Chemistry	Prof. Lars Ohrstrom
18.3. Division III – Organic and Biomolecular Chemistry	Prof. Nikolay Nifantiev
18.4. Division IV – Polymer Division	Prof. Christine Luscombe
18.5. Division V – Analytical Chemistry	Dr. Zoltan Mester
18.6. Division VI – Chemistry and the Environment	Prof. Hemda Garelick
18.7. Division VII – Chemistry and Human Health	Prof. Rita Cornelis
18.8. Division VIII – Chemical Nomenclature and Structure Representation	Prof. Alan Hutton

19. [18:40] Reports of Standing Committee Chairs (Written/video reports will be received and 5 minutes allowed for questions and discussion on each)

[Prof. Brett]

[For Information and Discussion]

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- |   |                              |
|---|------------------------------|
| 19.1. Committee on Chemistry Education (CCE)  | Prof. Jan Apotheker          |
| 19.2. CHEMRAWN Committee  | Prof. Francesca Kerton       |
| 19.3. Committee on Chemistry and Industry (COCI)  | Prof. Anna Makarova          |
| 19.4. Committee on Publications and Cheminformatics Data Standards (CPCDS)              | Ms. Leah McEwen              |
| 19.5. Interdivisional Committee on Terminology, Nomenclature and Symbols (ICTNS)        | Prof. Jurgen Stohner         |
| 19.6. Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD) | Prof. Pietro Tundo           |
| 19.7. Project Committee (PC)  | Prof. Jan Reedijk            |
| 19.8. Evaluation Committee (EvC)  | Prof. Javier García-Martínez |
20. [19:20] Adoption of Recommendations on Nomenclature and Symbols  
[Prof. Hartshorn]  
[For Information and Decision; by Delegation]
- Motion:** *Council formally adopts the Recommendations approved by the Interdivisional Committee on Terminology, Nomenclature and Symbols (ICTNS) and published, or scheduled to be published, in Pure and Applied Chemistry from August 2019 through August 2021.*
21. [19:25] Presentation of IUPAC service awards

**[20:00 Adjourn Day 2]**

**Council Meeting Day 3 –Sunday 15<sup>th</sup> August 2021**

**08:00 – 11:00 EDT (UTC-4)**

22. [08:00] Announcement of results of elections of Officers (Vice President and Treasurer) and Elected Members of Bureau  
[Prof. Hartshorn]
23. [08:15] Plans for the 52<sup>nd</sup> General Assembly and 49<sup>th</sup> Congress in 2023 (The Hague, Netherlands)  
[Prof. Floris Rutjes, Chair of the 2023 Organizing Committee]

Prof. Rutjes will provide an update to the Council on the status and plans for IUPAC2023.

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24. [08:30] IUPAC100 Legacy Activities

[Prof. Javier Garcia-Martinez]

Both the International Year of the Periodic Table and our Centenary IUPAC100 have provided us with a lot of visibility and have greatly contributed to improving our public image and global outreach. Four very specific online or hybrid initiatives that were launched during 2019 have been so successful that now are ongoing IUPAC activities prominently featured on our website. These are The Periodic Table Challenge, The Global Women Breakfast, The Top Ten Emerging Technologies in Chemistry, and ChemVoices. All of them help us reach different audiences and communicate what we do at IUPAC for the chemistry community in an effective and engaging manner.

25. [08:45] WCLM 2021 Program

[Prof. Christopher Ober]

WCLM Topic: “The Future of Chemistry in the World of Artificial Intelligence”

The impact of machine learning on chemistry is already enormous and is growing. IUPAC is influencing the growth of AI and other digital disciplines in chemistry through the work of its volunteers and this program will highlight new developments and opportunities in this chemical area for GA and WCC participants and the hybrid meeting being hosted from Montreal.

Other organizers of WCLM include Bonnie Lawlor, Jeremy Frey, Fabienne Meyers, Lynn Soby and Leah McEwen with the help of our Canadian hosts. Two weeks prior to the event a series of 6 short talks will be available to watch given by 6 panelists in different areas of AI impact on the chemical sciences.

We are carrying out an experiment to make this a truly global event over a 24 hour period in which the program begins Tuesday morning from Montreal (August 17) with a plenary talk by Yoshua Bengio (Montreal), is passed to a virtual panel discussion in Malaysia (next WCC/GA host), moves virtually to a follow-up panel discussion hosted by the Netherlands (future WCC/GA host) and returns to Montreal on Wednesday morning (August 18) for a panel discussion by the original speakers who represent industry, government and academia with a concluding talk by Jeremy Frey (Southampton) on the impact of AI on chemistry and the role of IUPAC in advancing the field.

At the time of this writing, the program is fixed, our speakers have committed to the event, and we are working on final details to make this a success.

We expect that the WCLM will be available in recorded form for future viewing and that it will also serve as a template for future global events IUPAC may consider organizing. In addition, there will be a report submitted to Chemistry International.

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26. [09:00] Applications for Associated Organization Status

[Prof. Hartshorn]  
[For Information]

No applications for Associate Organization Status have been received.

26.1. Termination of Associated Organizations

All Associated Organizations are current and no terminations are required.

27. [09:10] Associate National Adhering Organizations (ANAO)

[Prof. Hartshorn]

The Associate National Adhering Organization program is currently under review. The Kenya Chemical Society has completed the four-year term as ANAO. No NAO application has been received.

28. [09:15] Proposals Formally Received from National Adhering Organizations

[Prof. Hartshorn]

No proposals were received from the National Adhering Organizations.

29. [09:20] Approval of Division Arrangements

[Prof. Hartshorn]  
[For Information]

The Divisional rules were approved at the 50<sup>th</sup> Council meeting. No further additions/edits have been received by Bureau.

29.1. Approval of Elected Officers of Division Committees

[Prof. Hartshorn]  
[For Decision; by Delegations, or by simple majority (Bylaws B 2.2.3 and B 3.15)]

The Division Committee Officers list was revised 29 July 2021 and is included in the latest version of the Detailed Agenda dated 29 July 2021.

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Elected Officers of Division Committees 2022-2023

Position	Division I	Country	Term of Service
President	Prof. Pierangelo Metrangolo	Italy	2022-2023
Past-President	Dr. Tim Wallington	United States	2022-2023
Vice President	Prof. Frances Separovic	Australia	2022-2023
Secretary	Prof. Atilla Csaszar	Hungary	2020-2023
Position	Division II	Country	Term of Service
President	Prof. Lidia Armelao	Italy	2022-2025
Past-President	Prof. Lars R. Ohrström	Sweden	2022-2025
Secretary	Dr. Daniel Rabinovich	United States	2020-2023
Position	Division III	Country	Term of Service
President	Prof. Amelia Rauter	Portugal	2020-2023
Past-President	Prof. Nikolay E. Nifantiev	Russia	2022-2023
Vice President	Prof. Einar Uggerud	Norway	2022-2023
Secretary	Prof. Slawomir Jarosz	Poland	2020-2023
Position	Division IV	Country	Term of Service
President	Prof. Christine Luscombe	United States	2020-2023
Vice President	Dr. Igor Lacik	Slovakia	2020-2023
Secretary	Prof. Paul Topham	United Kingdom	2020-2023
Position	Division V	Country	Term of Service
President	Prof. David Shaw	United States	2022-2023
Past-President	Zoltan Mester	Canada	2022-2023
Vice President	Dr. Derek Craston	United Kingdom	2022-2023
Secretary	Prof. Luisa Torsi	Italy	2022-2023
Position	Division VI	Country	Term of Service
President	Prof. Roberto Terzano	Italy	2022-2023
Past-President	Prof. Hemda Garelick	United Kingdom	2022-2023
Vice President	Dr. Annemieke Forenhorst	Canada	2022-2023
Secretary	Prof. Fani Sakellariadou	Greece	2020-2023
Position	Division VII	Country	Term of Service
President	Dr. Helle Moller Johannessen	Denmark	2022-2023
Past-President	Prof. Rita Cornelis	Belgium	2022-2023
Vice President	Prof. Vladimir Gubala	United Kingdom	2022-2023
Secretary	Dr. Linda Johnston	Canada	2022-2025
Position	Division VIII	Country	Term of Service
President	Dr. Michelle Rogers	United States	2022-2023
Past-President	Prof. Alan Hutton	South Africa	2022-2023
Secretary	Prof. Risto Laitinen	Finland	2016-2023

**Motion 1:** Council approves the results from elections of Division Committee Officers.

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Elections for Divisional Titular Members have been completed.

The proposed 2022-2023 Division Rosters are in the Agenda Book for reference. (DC I Secretary was missing in earlier version)

**Motion 2:** *Council receives the results from elections of Titular Members of the Division Committees.*

29.2. Reauthorization of Commissions

[Prof. Hartshorn]

[For Decision; by Delegation]

Bylaw 3.32 requires that Council reapprove all existing Commissions at each General Assembly.

**Motion:** *Council reauthorizes the Commission on Physicochemical Symbols, Terminology and Units, the Commission on Isotopic Abundances and Atomic Weights, and the IUBMB-IUPAC Joint Commission on Biochemical Nomenclature (JCBN).*

30. [09:45] Motion for English Language as the official language of IUPAC

[Prof. Hartshorn]

[For Decision; by Delegation]

Statute 5.7.5 requires that Council determine every four years the one language in which the official records of the meetings of the Council, Bureau, and Executive Committee shall be kept and published. The last time that such a determination was made was at the General Assembly held in São Paulo, Brazil in the year 2017, four years ago.

**Motion:** *Council is asked to approve that the one language in which the official records of the meeting of the Council, Bureau and Executive Committee shall be kept and published will be English for the period of 2022-2025.*

31. [10:00] Important Matters Referred to Council by Bureau at 51<sup>st</sup> General Assembly, Not Covered by Items on Council Agenda

[Prof. Hartshorn]

32. [10:15] Any Other Business

[Prof. Brett]

[10:30] Closing Remarks, Acknowledgements, Adjournment

[Prof. Brett]

**[11:00] Adjournment of the 51<sup>st</sup> Council Meeting 2021**

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*Reference should be made to the Agenda Book for background information relating to the agenda items.*

**Day One of Council Meeting 10<sup>th</sup> July 2019**

**1. Introductory Remarks and Finalization of Agenda**

Prof. Zhou welcomed all NAO's, Council members and all other attendees to the Council Meeting and gave thanks to the management members of the IYPT and IUPAC 100 activities and collaborators. He also thanked the Secretariat staff for organizing the meetings and activities and their leadership roles in the committees, and facilitation of all projects for IUPAC. He acknowledged that the future of IUPAC in the current political climate will necessitate some challenges and change within the Union and uncertainty in the future. Prof. Zhou acknowledged that Council should be appraised of all information in the Agenda book. Prof. Zhou then introduced the Secretary General, Prof. Richard Hartshorn, who asked that the Agenda be Finalized. Prof. Hartshorn was asked by Prof. Zhou to chair the Council Meeting from that point onwards.

Prof. Hartshorn acknowledged those members of the Union who were each remembered as part of a moment of silence and a slide presentation.

He continued by explaining the voting methods to be used for scientific and non-scientific matters.

**2. Approval of Minutes of 49<sup>th</sup> Council Meeting and Matters Arising**

Prof. Hartshorn referred Council members to the draft minutes of the 49<sup>th</sup> Council meeting, which were included in the Agenda book for review, for voting by a show of hands.

*The Minutes of the 49<sup>th</sup> Council Meeting in São Paulo, Brazil were unanimously approved.*

**3. Ratification of Decisions Taken by Bureau and Executive Committee since 49<sup>th</sup> General Assembly.**

Prof. Hartshorn referred Council members to the Bureau and Executive Committee meeting minutes found in the Agenda book (as noted below) for vote by a show of hands.

All decisions taken by the Bureau and Executive Committee through calendar year 2018, since those approved by the Council at the meeting in São Paulo, Brazil in July 2017 (Agenda item 3, 49<sup>th</sup> Council Meeting), were contained in the following Minutes, which were distributed to National Adhering Organizations on the dates shown:

100 <sup>th</sup>	Bureau (São Paulo, Brazil, 11 & 14 July 2017)	07 September 2017
101 <sup>st</sup>	Bureau (Bratislava, Slovakia, 7-8 April 2018, Draft)	16 January 2019
102 <sup>nd</sup>	Bureau (Virtual Bureau, 6 April 2019, Draft)	
156 <sup>th</sup>	Executive Committee (London, UK, 18-19 November 2017)	19 January 2018
157 <sup>th</sup>	Executive Committee (Alcalá, Spain, 8-9 November 2018)	07 June 2019

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**A Summary of the decisions taken was included in the Agenda book.**

*Council ratified all decisions taken by the Bureau and Executive Committee through calendar year 2018, since those approved by the Council at São Paulo, Brazil (Agenda item 3, 49<sup>th</sup> Meeting).*

3.1 Finance Committee Options Work Group Report

Prof. Brett presented information on the Finance Committee workgroup and short-term financial needs of IUPAC. Additional comments on IUPAC finances were discussed in Agenda item 19.3.

4. Adoption of Recommendations on Nomenclature and Symbols

Prof. Hartshorn introduced the recommendations and asked for a show of hands for the vote.

*Council formally adopted the Recommendations approved by the Interdivisional Committee on Terminology, Nomenclature and Symbols (ICTNS) as published in Pure and Applied Chemistry from 2017 to 2019.*

5. Announcement of Nominations for Union Officers and Bureau Members

Prof. Hartshorn referred to the contents of Statute 5.7.1 and stated that the Council must elect Officers of the Union and Elected Members of the Bureau.

According to Bylaw 2.2.2.1, nominations are due at least two months prior to the beginning of the Council at which the elections will take place.

5.1 Candidates for Vice President

Prof. Javier Garcia Martinez (Spain)  
Prof. Dr. Supawan Tantayanon (Thailand)

5.2 Candidates for Secretary General

Prof. Richard Hartshorn (New Zealand) Second Term (2020-2023)

5.3 Candidate for Treasurer

Mr. Colin Humphris (UK) Second Term (2020-2023). If re-elected, the current Treasurer has already announced his intention to stand down at the end of 2021 after two more years. In this case, the terms of the future Secretary General and Treasurer would be staggered, which has the advantage of ensuring better continuity.

5.4 Candidates for Members of Bureau 2020-2023

Prof. Zhigang Shuai (China/Beijing)  
Dr. Ghada Bassioni (Egypt)

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Dr. Rabeay Hassan (Egypt)  
Prof. Mir Wais Hosseini (France)  
Dr. Bipul Behari Saha (India)  
Prof. Ehud Keinan (Israel)  
Prof. Pietro Tundo (Italy)  
Prof. Kew-Ho Lee (Korea)  
Prof. Gloria Obuzor (Nigeria)  
Dr. Carlos Tollinche (Puerto Rico)  
Dr. Petr Fedotov (Russia)  
Prof. Mei-Hung Chiu (China/Taipei)

6. Announcement of Time of Elections

Prof. Hartshorn announced that the elections for Vice President, Secretary General, Treasurer and Elected Members of the Bureau would be held at 09:00 hours on 11 July 2019. He then asked for a vote to appoint Election Tellers.

*Council unanimously approved the appointments of Michelle Rogers (USA), Jan Reedijk (Netherlands) and Fabienne Meyers (IUPAC Secretariat) as Election Tellers.*

7. Statutory Report of the President on State of the Union

Prof. Zhou reported on the challenges, improvements, and accomplishments of the Union in the current biennium.

To further implement the Strategic Plan, IUPAC introduced programs in different categories for members, approved a new National Subscription model and improved project management and Division/Committee operations. Further, the organization took initiatives on cheminformatics and chemistry for sustainable development as well as engaged with the younger generations. IUPAC volunteers actively participated in celebrations of the Centenary and IYPT 2019, which was organized by the bodies and NAO's. Celebrating the IUPAC 100-year history offered an opportunity to give the Union's overall condition and progress further consideration about the future. Dr. Zhou also discussed the Gold Book, trade booth activities and social media developments. A detailed report was available in the Council Agenda book. He noted the points below:

- Although NAO's under financial pressure chose to leave the Union, Company Associate and Affiliate Member programs have strengthened IUPAC representation in some of the other countries.
- Concerns about factors impacting future finances for IUPAC included member subscriptions, and revenue of publications and investments were discussed. Analysis of the Finance Committee working group report proved to be proactive in responding to potential shortfalls of income.
- This biennium was particularly challenging for the Secretariat due to the IUPAC 100-year anniversary and the IYPT celebration. Dr. Zhou emphasized the hard work and gratitude to all Secretariat staff and Dr. Lynn Soby, Executive Director.

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- The management of IUPAC training and education programs have helped local communities and less-developed countries to utilize and familiarize IUPAC with wide-reaching opportunities, including awards for young and new individuals in the chemistry field, including post-graduate summer schools.
- Dr. Zhou emphasized collaborative efforts with outside organizations in the areas of disseminating publications in different languages and multiple trade booths. Highlights included opportunities to recruit task group members, cheminformatics standards have helped to increase funding resources. In addition, IUPAC committees collaborated with the International Scientific Council and the ICE. Dr. Zhou thanked Prof. Hartshorn, Dr. Mary Garson, and Dr. Laura McConnell who were instrumental in assisting IUPAC to be an indispensable global resource for chemists.

8. Vice President's Critical Assessment

Prof. Brett submitted his critical assessment to Bureau in April, and it was included in the Agenda book for review. The highlights of the report included an examination of IUPAC's activities in the context of strategic plan and mission. The future development of IUPAC and scientific priorities, challenges in the chemistry community and ensuring the legacy of the IUPAC Centenary and the IYPT were included in the report found in the Agenda book. In addition to these, the need for a formal review of the IUPAC structure to ensure organizational sustainability was also addressed.

9. Report of the Secretary General

Prof. Hartshorn referred Council members to the formal report on the operation of the Secretariat, included in the Agenda book. He emphasized the following points:

- Secretariat Staffing and Workload (*included a standing ovation by Council*)
- Conference endorsements and gender balance
- Visits to Divisions and Committees
- Strategic Relationships
- Procedural issues

*Council asked that the Secretary General consider the possibilities of development of policies on Ethics.*

10. Applications for National Adhering Organization (NAO) and Associate National Adhering Organization (ANAO) Status and Ratification

Prof. Hartshorn announced three applications for National Adhering Organizations. All applications and supporting documentation were included in the Agenda book for review.

- 10.1 Singapore National Institute of Chemistry, (SNIC) NAO Status. After review of the materials and recommendations, the application was presented to the Council for a vote.

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*Council unanimously approved the Singapore National Institute of Chemistry (SSNIC) as a National Adhering Organization effective January 2020, by delegation. The NAO delegations additionally approved the ability for Singapore to vote during the remainder of the assembly.*

- 10.2 Costa Rica (LANOTEC-CeNAT) applied for readmission as NAO. After review of the materials and recommendations, the applications for readmission were presented to the Council for a vote.

*Council unanimously approved Costa Rica (LANOTEC-CeNAT) readmission as a National Adhering Organization effective 1 January 2020, by delegation.*

- 10.3 Jordan (Jordanian Chemical Society) applied for readmission as NAO with all required materials submitted for consideration and presented to Council for a vote.

*Council unanimously approved the Jordanian Chemical Society as a National Adhering Organization effective 1 January 2020, by delegation.*

11. Reports of Division Presidents

Written reports were received by members of Council and 10 minutes were allowed for questions and discussion for each Division. Prof. Hartshorn invited each Division President to report on the activities and status of their respective Divisions and to allow for questions from the Council Members. He referred Council Members to the Agenda book for detailed reports from each Division.

12. Approval of Divisional Rules

Prof. Hartshorn presented information on Statute 10.3 which provides that Divisions may adopt rules for their operations in addition to those specified elsewhere in the Statutes and Bylaws. Those rules must be approved by Council. The rules were included in the Council Agenda book for review.

*Council unanimously approved the proposed sets of Division Rules.*

13. Approval of Elected Officers of Division Committees

Prof. Hartshorn referred Council members to the Agenda book for election results and requested a vote on the slate of Officers of Divisions and Committees.

Officers of the eight IUPAC Divisions are listed below were approved by the Council.

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Position	Division I	Country	Term of Service
President	Dr. Tim Wallington	USA	2020-2021
Past-President	Prof. Ron Weir	Canada	2020-2021
Vice President	Prof. Pierangelo Metrangolo	Italy	2020-2021
Secretary	Prof. Attila Csaszar	Hungary	2020-2021
Position	Division II	Country	Term of Service
President	Prof. Lars R. Ohrström	Sweden	2018-2021
Past-President	Prof. Jan Reedijk	Netherlands	2018-2021
Vice President	Javier Garcia-Martinez	Spain	2018-2021
Secretary	Prof. Dan Rabinovich	USA	2020-2021
Position	Division III	Country	Term of Service
President	Prof. Nikolay E. Nifantiev	Russia	2020-2021
Past-President	Prof. Francesco Nicotra	Italy	2020-2021
Vice President	Prof. Amelia P. Rauter	Portugal	2020-2021
Secretary	Prof. Sławomir Jarosz	Poland	2020-2021
Position	Division IV	Country	Term of Service
President	Prof. Christine Luscombe	USA	2020-2021
Past-President	Prof. Gregory Russell	New Zealand	2020-2021
Vice President	Prof. Igor Lacik	Slovakia	2020-2021
Secretary	Prof. Paul Topham	UK	2020-2021
Position	Division V	Country	Term of Service
President	Dr. Zoltan Mester	Canada	2018-2021
Past-President	Prof. Jan Labuda	Slovakia	2018-2021
Vice President	Dr. David Shaw	USA	2020-2021
Secretary	Dr. Derek Craston	UK	2020-2021
Position	Division VI	Country	Term of Service
President	Prof. Hemda Garelick	UK	2020-2021
Past-President	Prof. Rai Kookana	Australia	2020-2021
Vice President	Prof. Roberto Terzano	Italy	2020-2021
Secretary	Prof. Annemieke Farenhorst	Canada	2020-2021
Position	Division VII	Country	Term of Service
President	Prof. Rita Cornelis	Belgium	2020-2021
Past-President	-		
Vice President	Dr. Helle Moller Johannessen	Denmark	2020-2021
Secretary	Prof. Vladimir Gubala	UK	2020-2021
Position	Division VIII	Country	Term of Service
President	Prof. Alan Hutton	South Africa	2020-2021
Past-President	-	-	-
Vice President	Dr. Michelle Rogers	USA	2020-2021
Secretary	Prof. Risto Laitinen	Finland	2020-2023

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*Council unanimously approved the results from elections of Division Committee Officers.*

Elections for Divisional Titular Members were unanimously approved, and the proposed 2020-2021 Division Rosters were in the Agenda book for reference. Prof. Hartshorn noted that there were some complications with the elections, which will be put to the Executive Committee during the upcoming year.

*Council received the results from elections of Titular Members of the Division Committees.*

Closing remarks for Day 1 of Council were given by Prof. Zhou, who thanked the Division Presidents and Officers for their reports and the tellers who assisted with the voting process. Dinner, a toast and all outstanding presentations were included in Prof. Zhou's comments. He reminded the delegations about the time of elections at 9:00 am and that the delegations need to be seated by that time.

## **Day Two of Council Meeting 11<sup>th</sup> July 2019**

### **14. Election of Officers of the Union and Elected Members of Bureau**

Prof. Hartshorn introduced a brief explanation of the election process, which was also included in the Agenda book.

Council elected Prof. Javier Garcia-Martinez as Vice-President for the term 2020-2021, by written and secret Ballot.

Council elected Prof. Richard Hartshorn as Secretary General for the term 2020-2023, by written and secret Ballot.

Council elected Mr. Colin Humphris as Treasurer for the term 2020-2023, by written and secret Ballot.

Council elected the following members of Bureau for the term 2020-2023, by written and secret Ballot.

Dr. Ghada Bassoni (Egypt)  
Prof. Mei-Hung Chiu (China/Taipei)  
Prof. Petr Fedotov (Russia)  
Prof. Ehud Keinan (Israel)  
Prof. Gloria Obuzor (Nigeria)  
Dr. Bipul Behari Saha (India)

*Council ratified the elections of the new Vice President, Secretary General, Treasurer and Elected Members of the Bureau at the 50<sup>th</sup> General Assembly in Paris, France.*

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Prof. Hartshorn stated that three members of the Executive Committee will be elected by Bureau from the elected members of the Bureau following Council Meeting.

15. Bids for and voting on Site and Dates of 53<sup>rd</sup> General Assembly and 50<sup>th</sup> Congress

Prof. Hartshorn announced the three bids for the GA and WCC in 2025, with details for review in the Agenda book. Prof. Hartshorn noted the vote would follow the pattern of the elections used for Officers of the Union (Bylaw 2.2.2.2). If no bid received a majority on the first ballot, the bid which received the fewest number of votes would be eliminated and another ballot would be conducted. The bid receiving the majority of votes cast will be deemed selected to host the 2025 WCC/GA. Representatives from The Malaysia Institute Kimia, The Nigerian Chemical Society and The Chemical Society of Thailand all made presentations regarding their bids and host sites.

*Council (by written and secret ballot) voted that the Institute Kimia Malaysia, IKM will host the 50<sup>th</sup> World Chemistry Congress and 53<sup>rd</sup> General Assembly 11-18 July 2025, in Kuala Lumpur, Malaysia.*

16. Reports of Standing Committee Chairs

Prof. Hartshorn referred Council members to the written reports for review found in the Agenda book. Brief oral reports were given as below by the Committee Chairs.

Council received all reports from the Standing Committees, Bureau Committees, and Interdivisional Committees.

17. Presentation of IUPAC Distinguished Service Awards

Prof. Hartshorn and Prof. Zhou presented IUPAC Service Awards to individuals as noted in the Agenda book.

**Council Lunch**

18. Financial Reports

Mr. Humphris announced that the Finance Committee met in February 2018 and 2019, as well as quarterly via web interface to review the performance of the Investment Portfolio and the advisors who manage it. Both sets of approved minutes from these meetings are contained in the Agenda book for review. The financial information contained in the minutes preceded the audit.

18.1 Biennial Report of the Treasurer

The Council members were informed of the Union's poor financial health.

Over the biennium 2017/18, IUPAC recorded a loss of (\$215,552). Although this was in large part due to an un-realized loss in value of investments following stock market falls at the end of 2018, the two years include pointers to an unsustainable future if finances at IUPAC make

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no changes. At the 2018 meeting, the Finance Committee was sufficiently concerned about the outlook that it commissioned a Financial Review Working Group to consider actions if faced with material shortfalls >\$200,000 in income. The concerns were founded on:

- the impact of the planned change of formula for National Subscriptions for 2019 onwards and the possible loss of NAOs,
- the ambitious budget for 2018/19 to grow income rapidly from the Company Associate (CA) and Affiliate Members (AMP) programs (e.g., for CA's from income of just \$5,950 in 2016 to \$55,000 in the proposed 2019 budget).
- the difficult trading conditions for publishing,
- an uncertain outlook for the financial markets.

The report was included in the Agenda book (item 3.2) and edited only to remove some staff confidential information, for review. At its 2019 meeting, the working group members endorsed highly pertinent changes for both the short (the next budget cycle) and longer term (into our next century).

The first draft for the 2020/21 budget on a business-as-usual basis and, taking into account all recent known changes, leads to a biennium loss of ~\$500k. Losses on this scale are unsustainable and the Union could become inoperable over the next 4 – 6 years. Addressing this is therefore a matter of priority.

## 18.2 Report of the Finance Committee

The Finance Committee met face to face in February of 2018 and 2019 to review the performance of both the Investment Portfolio and IUPAC financial advisors. All minutes were approved and are included in the Council Agenda book for review and information.

Recommendations included (in brief):

- Short term, the creative use of the financial portfolio, reduced travel and subsistence costs and a review of the Secretariat competencies and location is advisable.
- To make improvements in the Budget Cycle, discretionary governance meetings should be virtual, budgets should be rebalanced to focus more on projects, and emphasis on the Centenary Endowment should be priorities.
- For the longer term, rethinking governance structure, seeking opportunities to simplify and refocus science of the organization, and reassessing Secretariat tasks would be options.
- Supported the Executive Committee decision to terminate CHEMRAWN and bring this to Bureau and Council for approval.
- Fully endorsed the recommendations of the Financial Review Working Group
- In consideration of the 2020/2021 Budget, there were 3 core recommendations made to Bureau for Council with an emphasis on moving quickly to a balanced budget:

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- For a budget which included a desire to prioritize project expenditure whilst reflecting the trend to continue the increase in numbers of cross-Division projects (via the Project Committee), Cheminformatics and Sustainable Development. The recommended closure of CHEMRAWN, reduction of increasingly expensive international travel for meetings through the use of modern web-based meeting and webinar technologies. The Budget assumes that the Executive Committee and Bureau meeting would only be face-to-face at the General Assembly. The Finance Committee is already meeting quarterly via Go To Meeting. Operations budgets are reduced assuming off year Division and Committee meetings will be held virtually. Altogether this halves the deficit to \$250K, it does not provide a balanced budget. More therefore must be done; recommendation to follow.
- That IUPAC undertakes a complete review of its structure and processes so that we can ensure that we undertake our core science work as effectively as possible whilst enabling those who have interest in our work to engage in and support it – International organizations, industry, foundations, and government agencies.
- Establish a “Centenary Endowment Fund” to help raise income. This will require hard work across the Union and is not a “magic bullet”.

### 18.3 Accounts for 2017/2018

#### 18.3.1. Profit and Loss Statements

The P&L Statement was included in the Agenda book for thorough review and briefly summarized, noting that a combined loss over two years was principally due to the investment portfolio performance. Other income variations included a decrease in National Subscriptions, a lack of ideal increase in Company Associates Subscriptions and Affiliate Memberships, and the lack of income from publishing databases. Expenses fell below planned costs at the Secretariat, primarily due to salary deviations. Total travel and meeting costs were within planned expenses, as well. The detailed IUPAC Income Statement was included in the Agenda book for further reference.

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IUPAC Income Statement - 2018 Summary				
	2017 Actual	2018 Actual	2018 Annual Budget	2018 Actual vs Budget Variance
Income				
Program Income	\$ 1,206,634	\$ 1,177,861	\$ 1,291,319	(113,458)
Direct Public Support	15,541	20,000	36,000	(16,000)
Investments	445,541	(210,110)	141,000	(351,110)
Sponsorship Revenue	0	27,821	0	27,821
Merchandise Revenue - Pins	0	1,210	0	1,210
Total Income	1,667,716	1,016,782	1,468,319	(451,537)
Gross Profit	\$ 1,667,716	\$ 1,016,782	\$ 1,468,319	(451,537)
Expense				
Awards, Grants & Contribution	28,749	40,551	0	(40,551)
Fixed Costs - Salaries & Benefits	540,447	512,403	607,952	95,549
Lease, Insurance & Bank Fees	95,838	99,623	83,832	(15,791)
General & Administrative Expenses	90,049	71,504	60,795	(10,709)
Contracted Services	83,199	147,845	63,750	(84,095)
Depreciation Expense	38,684	45,185	46,104	919
Other Expenses	27,392	28,527	28,100	(427)
Travel & Meetings	656,338	433,261	423,559	(9,702)
Miscellaneous Expense	(35,536)	10,484	0	(10,484)
Total Expenses	\$ 1,525,160	\$ 1,389,383	\$ 1,314,092	(75,291)
Net Ordinary Income / (Loss)	\$ 142,556	\$ (372,601)	\$ 154,227	(526,828)
Other Income & Expenses				
Other (Income)	(587)	(355)	0	355
Other Expense	(9,550)	(4,001)	10,000	14,001
Net Other Income & Expense	\$ (10,137)	\$ (4,356)	\$ 10,000	14,356
Net Income / (Loss) for the period	\$ 152,693	\$ (368,245)	\$ 144,227	(512,472)

### 18.3.2. Balance Sheet as of 31 December 2018

The full balance sheet was included in the Agenda book for Council review. Generally, it showed a healthier position at the end of 2018. By the end of May 2019, the loan previously taken was paid down. Although Accounts Receivable were down by the end of 2017, Accounts Payable were up at the end of 2018, showing significant improvement. The balance sheet is included below.



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IUPAC Balance Sheet As of 31 December 2018				
		2017	2018	2017 / 2018 Variance
<b>ASSETS</b>				
	Current Assets			
	Checking/Savings			
	Total Checking/Savings	303,987	380,224	76,237
	Accounts Receivable			
	Total Accounts Receivable	305,638	175,693	(129,945)
	Other Current Assets			
	Undeposited Funds	0	606	606
	Inventory	0	0	0
	Sales Tax Receivable	907	627	(280)
	Total Prepaid Expenses	4,822	27,132	22,310
	Total Other Current Assets	5,729	28,365	22,636
	Total Current Assets	615,353	584,281	(31,072)
	Fixed Assets			
	Total Fixed Assets	192,078	175,536	(16,542)
	Other Assets			
	Security Deposits	3,565	3,565	0
	Total Marketable Securities	4,097,527	3,729,826	(367,701)
	Total Other Assets	4,101,092	3,733,391	(367,701)
	<b>TOTAL ASSETS</b>	<b>\$ 4,908,523</b>	<b>\$ 4,493,208</b>	<b>\$ (415,315)</b>
<b>LIABILITIES &amp; EQUITY</b>				
	Liabilities			
	Current Liabilities			
	Accounts Payable			
	Total Accounts Payable	198,792	89,732	(109,061)
	Total Credit Cards	1,053	4,798	3,746
	Other Current Liabilities			
	Total Payroll Liabilities	49,035	41,746	(7,289)
	Total Unearned Membership Income	50,702	158,978	108,276
	Unearned Publication Inc	125	0	(125)
	Deferred Rent	19,351	15,640	(3,711)
	Total Short-term Notes Payable	350,000	311,094	(38,906)
	Total Other Current Liabilities	469,213	527,458	58,244
	Total Current Liabilities	669,058	621,988	(47,070)
	Total Liabilities	669,058	621,988	(47,070)
	Equity			
	Net Asset w/ Donor Restriction	204,357	204,357	0
	Net Asset w/o Donor Restriction	111,809	108,761	(3,048)
	Unrestricted Net Assets	3,770,606	3,926,347	155,741
	Nominal income / (loss) for the period	152,693	(368,245)	(520,938)
	Total Equity	4,239,465	3,871,221	(368,245)
	<b>TOTAL LIABILITIES &amp; EQUITY</b>	<b>\$ 4,908,523</b>	<b>\$ 4,493,208</b>	<b>\$ (415,315)</b>
Audit 2018 Figures				

### 18.3.3. Cash Flow report for 2017/2018

The Cash flow summaries were similar to other years in that they were reliant on National Adhering Subscription payments, those in arrears, and receipt of other payments in a timely fashion.

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18.3.4. National Adhering Organizations in Arrears

At the time of the Council meeting, there were three NAO's whose membership status was in arrears and in danger of defaulting on the subscription for 2018: Mozambique, Puerto Rico (who had a shortage of funds) and Cuba.

18.4 Other Income

18.4.1. Investment Portfolio

The Investment Portfolio was reviewed by the Finance Committee and IUPAC advisors on a quarterly basis. The Asset Allocation, Benchmark Performance and Portfolio Snapshot were presented to the Council members and additional details were available in the Agenda book.

18.4.2. Publishing

IUPAC's net share of publishing income from PAC and CI from the agreement with De Gruyter in 2018 was shown and the general net cost steered toward continuation of digital-based content in all areas.

18.4.3. Company Associates

The changes to the status of Company Associates and the subscription structure was implemented for 2018 and included the increase over time for Heritage members and a higher rate for new subscribers. IUPAC leadership was encouraged to assist in focusing companies on this new membership status.

18.4.4. Affiliate Member Program

Council approved changes to the Affiliate Member Program at the previous Council meeting, which included a price increase for base membership, and removed the American Chemical Society as the management of the program. IUPAC will manage the individual Affiliate Membership for the ACS with the full subscription amount going to IUPAC. The budget expectation for 2020/2021 was revised to accommodate this process and gaining AMP's will continue to be a major focus.

18.4.5. Establishment of the Centenary Endowment Fund and Mechanism

At the past Council meeting, Council approved the EC proposal to create an Endowment Fund. Core principles of this fund included an establishment of the endowment and its guiding documents, the administration of the Board of Directors and the offer of exemption for tax purposes to investors.

*Council approved the future appointment of the Centenary Endowment Fund Board of Directors including the external Directors by the Executive Committee. Council also gave approval to the Executive Committee to progress in the formation of the fund and its guiding documents.*

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18.5 Appointment of Auditors for 2019

Following approval of a change in auditors, the Finance Committee made a recommendation to Appoint McMillan, Pat and Company, LLP for future audits, which was accepted by the EC and Bureau for proposal to Council.

*(By show of hands) McMillan, Pate and Company, LLP were appointed as auditors for IUPAC for financial year 2019 onwards.*

19. Organizational Changes in Existing IUPAC Bodies, Proposals for New and Reconstituted Bodies/Terms of Reference

19.1 Executive Committee Recommendation to Dissolve CHEMRAWN

Following extensive review of CHEMRAWN, included in the Agenda book, (item 16.9) the EC resolved unanimously to recommend to Council that CHEMRAWN be dissolved, with its responsibilities to be distributed to other appropriate IUPAC bodies. This recommendation was endorsed by the Bureau.

Prof. Hartshorn introduced this item and stated that comments would be limited to one per person. The Evaluation Committee reported the progress on the evaluation of CHEMRAWN at the 2017 Bureau meeting in Bratislava and at the Executive Committee in November 2018 in Alcalá de Henares, Spain. The unanimous decision by the EC to recommend disbanding CHEMRAWN was communicated to the Standing Committee Chair of CHEMRAWN in December 2018 and replied to by the chair of CHEMRAWN in January 2019. Bureau endorsed a revised report recommending disbandment in April 2019 and this was included in the Council Agenda for consideration and approval.

Prof. Hartshorn then invited comments from the Council Audience:

Dr. Sunday Okeniyi, Nigeria, stated that a review of the CHEMRAWN activities showed that about 4 of them could be synergistic with the IUPAC Divisions. Most importantly, in relation to the topic of “world needs”, he stated that CHEMRAWN had been doing wonderful and important programs, particularly in African nations. He believed that CHEMRAWN should prioritize and have leadership in driving the world needs aspect of IUPAC.

Prof. Leiv Sydnes, former President of IUPAC and Chair of CHEMRAWN then read his comments to the audience. He stated that he did not know how to interpret the comment regarding limiting people to one question or comment regarding the dissolution of CHEMRAWN and then provided a review of his tenure in CHEMRAWN. There was a viewpoint from the Norwegian delegation and outside IUPAC’s Divisions and Committees, that “Sustainability” had been addressed for many years in CHEMRAWN, beginning in 1978 at the first CHEMRAWN conference. He stated that it looked strange to him to remove CHEMRAWN and keep the newly formed, Interdivisional Committee on Green and Sustainable Development (ICGCSD). He believed that the situation of CHEMRAWN should be deferred pending the Organizational Structure Review Group’s report. He referred to items 19.3 and the 20.2 Budget, in which it appeared to him that an assumption had been made in the development of the

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proposed budget for 2020-2021. His opinion was that it would be better to put money in the Budget until CHEMRAWN's removal gets approved. Prof. Sydnes then reviewed a past time when the Union was in financial trouble, due to the Commissions, in 1993. The United States had threatened to leave if nothing changed with the Commissions. A proposal was made to eliminate all Commissions and put in their place what is now known as the Project Committee. Prof. Sydnes observed that the President's and Vice President's reports talked about the Divisions and some Standing Committees in the work of the Union, but no comments included CHEMRAWN. In recent years, CHEMRAWN had not held a Conference every second year, as it had done in the past.

He noted that during the Opening Ceremony in Paris, Dr. Danielle Fauque presented the history of IUPAC and pointed out the unique position of CHEMRAWN in IUPAC. Prof. Sydnes reiterated that a proper review should be done by the review group.

Prof. Sydnes then spoke about his personal experiences in CHEMRAWN and focused on the Malta Conferences and the relationship with OPCW. He spoke to Dr. Laura McConnell's question regarding ethics. He reviewed CHEMRAWN's history with OPCW in the development of a Living Code of Ethics of Chemists (CCE, CHEMRAWN, COCI), which became the basis for OPCW's Hague Ethical guidelines. OPCW invited IUPAC as an "arm's length" organization to write this document, as an independent view was important to OPCW. IUPAC and OPCW now have an MoU, a different situation but he was supportive of it.

He expected the knowledge in CHEMRAWN and OPCW be transferred across all Divisions and Committees of IUPAC.

He reviewed the Vice President's statement which asked if IUPAC needs professional help to raise funds and stated that CHEMRAWN had done this throughout its history. Other statements referred to the formation of ICGCSD and that the Officer and Executive Committee did not communicate with him nor CHEMRAWN members regarding the establishment of ICGCS nor its' extension into the Sustainable Development area.

Prof. Sydnes asked to postpone the decision on CHEMRAWN until the review group report had been submitted. Work should be done in CHEMRAWN to integrate other IUPAC organizations and perhaps work with ISC given the importance of chemistry in much of their work which would help CHEMRAWN sustain itself.

At the conclusion of his remarks, he stated that this motion should not carry.

Questions and Comments following Prof. Sydnes' statement to Council:

Dr. Sunday Okeniyi, Nigeria Asked if it was possible to put a motion to Council? Prof. Hartshorn responded that the appropriate way would be to vote against the motion and vote positively for item 19.3, the Organizational Review item.

Colin Humphris (Treasurer), responded to Prof. Sydnes' comment that the Budget should have been drafted after the decision about CHEMRAWN. Mr. Humphris stated that the Budget was

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drafted with a view of operational budgets and did not consider the decision put forth by the Executive Committee.

Neil Burford (Canada): Would it be possible for the delegations to discuss amongst themselves?

Prof. Hartshorn suggested to continue until the scheduled tea break and then reconvene.

Leo Merz (Switzerland): Why, simply put, did CHEMRAWN get shot down? In simple terms.

Prof. Brett responded: The recommendation from the EC does not reflect the quality of the individuals and the work can better be done in other ways/IUPAC bodies.

Prof. Hartshorn committed to ensuring the CHEMRAWN responsibilities would be distributed to other appropriate bodies, should Council vote to dissolve CHEMRAWN. Following a 15-minute tea break, the delegations then returned to the Council Room.

Prof. Hartshorn answered a question that arose during the break, stating the dissolution of CHEMRAWN would be effective at the end of the current biennium.

Angela Wilson (USA): The question is, basically that CHEMRAWN did conferences, remind us how much \$\$ were allocated.

Mr. Humphris (Treasurer): The amounts were 14/15 27.5, 16/17 27.0, 18/19 25.0 k. Over the years, compared to Divisions, the CHEMRAWN operations budget was on the “large side” of the Divisions, who have also had proportional reductions since 2014/15.

Mary Garson (Australia): As a quick clarification, the Herbal Medicine Conference initiative came to Division III as a proposal and was not conceived by the CHEMRAWN Committee.

Prof. Hartshorn then stated that Council would proceed with the vote and it would be by Delegation.

Following the comment period, Prof. Hartshorn introduced the motion to Council and would vote by show of hands by Delegations; The votes were recorded as follows: (Against 74/Favor 45/Abstain 29). The motion was not approved by Council.

*Council did not approve the EC recommendation to Dissolve/Disestablish CHEMRAWN.*

## 19.2 Bureau Membership

As outlined in the Report of the Secretary General, discussion took place regarding membership of the Bureau. The Secretary General made the recommendation for chairs of the science-based standing committees to be full voting members of the Bureau.

*The Chairs of CPCDS, ICTNS, CCE, COCI and ICGCSD were approved by Council to be full voting members of the Bureau.*

## 19.3 Proposal for Organizational Review

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*The Council approved the Executive Committee recommendation to establish a working group to undertake a complete review of the organizational structure of IUPAC.*

20. National Subscriptions for 2020-2021 and Proposed Budget

Mr. Humphris reviewed the results of the special Council information/discussion sessions regarding the NSTF proposal of a modified subscription model.

He stated that the model adopted by Council will be implemented for the next two Biennia to 2023 when data will be updated, and further changes may be made. The status update letter to the NAO's was referred to in the Agenda book.

20.1 Proposed Budget for 2020-2021

The Council was presented with a proposed budget and rationale in the Council Agenda book for information only. The Finance Committee recommended that it be adopted, and the EC additionally agreed, after further discussions.

*Council approved the recommended 2020 – 2021 Budget.*

**Council Break**

21. Associated Organizations of IUPAC

21.1 No New Associated Organizations joined 2017-2019

21.2 Termination of Associated Organizations

AO's of IUPAC pay annually USD 50.00 and SEANAC, EFCE and EFC were 24 months in arrears at the time of the Council meeting.

*Council approved removal of SEANAC and EFCE as IUPAC Associated Organizations.*

22. Associate National Adhering Organizations (ANAO)

Ghana Institute for Pure and Applied Chemistry was approved for ANAO status from 2014-2017 and had then to decide to become a full NAO. However, they had not paid invoices for 2016 or 2017 and were identified for removal from the ANAO program.

*Council approved removal of Ghana Institute for Pure and Applied Chemistry as an ANAO of IUPAC.*

23. Proposals Formally Received from National Adhering Organization

There were none received from NAO's.

24. Proposals for Changes to the Statutes and Bylaws of the Union

There were none received from NAO's.

25. Reauthorization of Commissions

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Bylaw 3.302 requires that Council reapproves all existing Commissions at each General Assembly.

*Council reauthorized the Commission on Physiochemical Symbols, Terminology and Units, the Commission on Isotopic Abundances and Atomic Weights, and the IUBMB-IUPAC Joint Commission on Biochemical Nomenclature (JCBN).*

26. IUPAC 100 Centenary Report

Prof. Garson reported on progress, activities, and status of the IUPAC 100 Centenary. The celebration occurred on 8 July 2019.

27. IYPT 2019 Report from the Management Committee (MC)

Prof. Reedijk and Prof. Tarasova reported on the MC and referred to the detailed report prepared for Council on outcomes from major events and how they will be housed in IUPAC archives and museums.

28. WCLM 2019 Report

Prof. Ober reviewed the 2019 WCLM which took place earlier in the Congress meeting.

29. Plans for 51<sup>st</sup> General Assembly and 48<sup>th</sup> Congress in 2021 (Montreal, Canada)

Prof. Burford provided an update to the Council on plans for IUPAC 2021.

30. Plans for the 52<sup>nd</sup> General Assembly and 49<sup>th</sup> Congress in 2023 (The Netherlands)

Mr. Toering provided an update to the Council members on the status of plans for the 2023 events and meetings.

31. Important Matters Referred to Council by Bureau at 50th General Assembly, Not Covered by Items on Council Agenda

Prof. Hartshorn noted that all items from the Bureau had been addressed through the Agenda.

32. Prof. Zhou's concluding speech included his thanks to everyone involved in the Council Meeting and General Assembly and for a very successful meeting. He talked about respectful discussions and importance of diversity of opinions and remarks to help the Union be better.

From the US National Committee, Prof. Zhou read the prepared resolution on behalf of Council.

Be it resolved that the Council of the International Union of Pure and Applied Chemistry express appreciation of the Council and the Union and the organizers of 47<sup>th</sup> World CC and 50<sup>th</sup> GA for their outstanding organization, technical sessions and hospitality that ensure the success of the meetings. Be it further resolved that the Council expresses their appreciation to the Secretariat for their outstanding planning and execution of this event and throughout the biennium. (*applause*).

Flowers were presented to Prof. Tarasova and Dr. Lynn Soby. He then adjourned the Council meeting.

**Meeting was Adjourned.**

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\_\_\_\_\_  
**DATE**\_\_\_\_\_

**PROFESSOR CHRISTOPHER BRETT - PRESIDENT**

\_\_\_\_\_  
**DATE**\_\_\_\_\_

**DR. LYNN SOBY - EXECUTIVE DIRECTOR**

# International Union of Pure and Applied Chemistry

## 105<sup>th</sup> MEETING OF BUREAU

VIRTUAL MEETING 16 AND 17 APRIL 2021

### DRAFT MINUTES

Attendees: Prof. Christopher Brett (Chair), Prof. Javier García Martínez (Vice President), Prof. Richard Hartshorn (Secretary General), Mr. Colin Humphris (Treasurer), Prof. Qi-Feng Zhou (Past President), Prof. Russell J. Boyd, Prof. Mary Garson, Prof. Christopher K. Ober, Prof. Ken Sakai, Prof. Ghada Bassioni, Prof. Mei-Hung Chiu, Dr. Petr Fedotov, Prof. Ehud Keinan, Dr. Bipul Behari Saha, Dr. Tim Wallington, Prof. Lars R. Ohrström, Prof. Nikolay E. Nifantiev, Prof. Christine Luscombe, Dr. Zoltán Mester, Prof. Hemda Garelick, Prof. Alan Hutton, Prof. Francesca Kerton, Ms. Leah McEwen, Prof. Pietro Tundo, Prof. Jürgen Stohner, Prof. Anna Makarona, Prof. Alan Hutton, Prof. Gloria Obuzor, Prof. Rita Cornelis, Prof. Jan Apotheker

Guest: Dr. Lynn Soby (Executive Director), Dr. Fabienne Meyers (Associate Director)

Secretary: Lisa Musty

#### FRIDAY 16 APRIL 2021

##### 1. INTRODUCTORY REMARKS AND WELCOME

Prof. Brett welcomed all participants and thanked them for joining the virtual meeting. He also noted that there was a quorum, and the meeting will be held in two parts. He also noted that using the process of submission to Cognito forms will continue to be used, however, some items have not been included and the process needs fine-tuning for the General Assembly.

##### 2. FINALIZATION OF AGENDA

Prof. Brett reviewed the agenda and timing to clarify each item.

##### 3. MINUTES OF THE 104<sup>TH</sup> MEETING OF THE BUREAU (25 APRIL 2020)

Prof. Richard Hartshorn asked for comments or questions and asked for approval of the minutes.

**Motion:** *The Bureau unanimously approved the draft minutes of the 104<sup>th</sup> Bureau meeting.*

##### 4. MINUTES OF THE 159<sup>TH</sup> EC MEETING

Prof. Hartshorn brought the Bureau's attention to the minutes of the 159<sup>th</sup> Executive Committee Meeting of the Bureau included in the Agenda book and asked if there were any questions or comments.

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**4.1 RECEIPT OF DRAFT EXECUTIVE COMMITTEE MINUTES BY BUREAU**

The Secretary General noted that the 159<sup>th</sup> Executive Committee meeting minutes were included in the Agenda book.

**4.2 ITEMS OF NOTE RELATING TO THE EXECUTIVE COMMITTEE DECISIONS**

There were no questions about items from the minutes of the Executive Committee.

**5. REPORT OF THE PRESIDENT**

Prof. Brett shared his report with the Bureau. He highlighted that Bureau Meetings in 2020 and 2021 had been planned to be virtual. The Organizational Structural Review Group report was finalized in December 2020. He referred to two new Standing Committees which had been proposed, being the Centenary Endowment Board and Subcommittee on Ethics Diversity and Equity and Inclusion. Prof. Brett announced that there would likely be fewer new projects in the biennia and fewer or cancelled IUPAC-endorsed conferences. Additionally, the Proposed International Year of Basic Sciences for Sustainable Development will be postponed until July 2022 or June 2023. Collaborations with other organizations continue to go well with ISC and OPCW, the IYPT legacy activities, the Periodic Table Challenge, the Global Women's Breakfast and the Best Emerging New Technologies were all well-received. Time-investment was the same or more than is usual. Prof. Brett announced Dr. Soby's retirement in October of 2022 and thanked the staff of the Secretariat staff, as well. The search for a new Executive Director will commence by new committee shortly after the General Assembly.

**6. FINANCE AND BUDGETS**

**6.1 UPDATE BY TREASURER**

Mr. Humphris announced that the pandemic meant that IUPAC had to adjust to functioning virtually in order to reduce the operating budget. The operating profit was positive \$199,694, somewhat due to the PPP from the US government, having converted to a grant because of employee retention. AMP income from Chemical Societies was under budget by \$10K and IUPAC direct AMP income came in over budget by \$3,300. In addition, there was growth in income from Company Associates. Net interest and dividends from investments were low and consideration of the portfolio as an income generation may need to be reconsidered. Net of the portfolio resulted in losses of \$212,996 due to the numerous activities and the loan acquired to support them. The Balance Sheet for 2020 led to a healthy year-end cash supply. The line of credit has been fully repaid. Mr. Humphris asked if there were any questions or comments on his report and there were none at that time.

**6.2 REPORT OF FINANCE COMMITTEE MEETING MARCH 2021**

Recommendations and Actions included the Finance Committee support of the Bureau decision to support the IYBSSD International year for 10,000 € for 2 years. Additionally, the Finance Committee endorsed the Centenary Endowment Fund paperwork to be sent to Bureau for approval. There was no statute change for this allowance, but a Standing order

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will be required. In addition, the Finance Committee endorsed the 2022-2023 draft budget proposals for Bureau Consideration and approval.

### 6.3 PROPOSED BUDGET FOR 2022/2023

Mr. Humphris noted that year 2021 left IUPAC in a strong cash position with substantial underspending, mostly due to the Virtual GA and WCC. IUPAC will continue to build on the experience of virtual meetings, but certainly travel in the future is hopeful. There will be somewhat reduced operating budgets of Standing Committees in 2022-2023, with more focus on projects in Divisions. An allowance for CHEMRAWN and the Centenary Endowment Board has been in progress. Mr. Humphris emphasized that estimates for the Netherlands General Assembly in 2023 is less expensive than Paris. Mr. Humphris noted that there will be two options for the 2022-2023 budget presented to the Bureau.

- Option 1: Business as usual assuming return to “normality” in 2022
- Option 4b: Presentation indicates very low project activity during pandemic in 2020 and 2021, and spreading existing biennium budgets into 2022 while also moving benefits of underspent funds in 2021 to the budget for 2022.

**Motion:** *The Bureau unanimously approved the presentation of budget 4b to Council.*

## 7. NAO'S NATIONAL SUBSCRIPTION PAYMENT STATUS

NAO NS 2020 Payments currently in Arrears are to Chile, Jordan, South Africa and Turkey.

### 7.1 EXTERNAL FUNDING SOURCES AND RELATED PROJECTS

Suggestions for CEB membership were welcome for approval by Bureau for presentation at the upcoming Council meeting. Mr. Humphris asked for any and all suggestions on individuals to join the Committee.

### 7.2 2020 AUDIT REPORT

The Auditors reviewed draft policies and the Bureau and IUPAC accounting staff provided feedback. Of particular note was the De Gruyter contracts and payment.

## 8. VICE PRESIDENT'S CRITICAL ASSESSMENT

Prof. García Martínez referred Bureau members to his report included in the Agenda book. He noted highlights, including the impact of the pandemic on IUPAC and many other organizations. Prof. García Martínez additionally emphasized the legacy activities which were very successful and the process of modifying Bylaws and Statutes, to be done at a Special Council Meeting in the near future.

Increasing IUPAC's online presence has been very positive and IUPAC members have been meeting regularly and effectively. Although online meetings introduced some disadvantages, including time zone allowances, less time for quality discussions and no informal one-on-one conversations, the vast

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majority were successful. He discussed holding large conferences like the WCC online and that it will continue to be a major unknown as many people are not willing to pay significant fees to attend them virtually. Electronic voting has been successful. Prof. García Martínez continued by outlining some risks including the low number of project proposals submitted, possibility due to lack of travel and fewer in-person meetings. NAO engagement in some countries will continue to be important for retention of current countries and to attain new NAO's in areas of the world where IUPAC presence is lacking. Prof. García Martínez emphasized collaboration with large scientific and international organizations thus far has been minimal, such as UNESCO, the UN and WHO. Additional potential risks advised by the Review Group were IUPAC governance and key committees, which are too numerous and represent a challenge. Ethics, diversity, and inclusion have been a vital part of group discussions. Additionally, some untapped opportunities for IUPAC would be finding contacts in non-NAO countries, and to continuing to utilize current workgroups and projects to maximize contacts in more countries.

## 9. REPORT FROM THE SECRETARY GENERAL

Prof. Hartshorn discussed the challenges of the Union in terms of the current global pandemic and stated he would continue to be in contact with Bureau members. Individuals involved in projects which were cancelled and postponed due to the pandemic will be consulted for feedback in writing or other communication. Prof. Hartshorn also commented on development and approval of several policies in draft form for Council consideration. These motions were then voted on by Bureau members.

**Motion:** *Bureau unanimously approved the draft of Conflict-of-Interest Policy for consideration by Council.*

**Motion:** *Bureau unanimously approved the draft Privacy Policy for consideration by Council.*

**Motion:** *Bureau unanimously approved the draft Harassment Policy for consideration by Council.*

**Motion:** *Bureau unanimously approved the draft Financial Document Retention Policy for consideration by Council.*

## 10. IUPAC ORGANIZATIONAL REVIEW

### 10.1 BUREAU PROPOSALS FOR NEW STANDING COMMITTEES (CIDEI AND ENDOWMENT BOARD)

Prof. García Martínez discussed the mission of CIDEI and referred to the Agenda book for the detailed report. He highlighted five of the goals of CIDEI and terms of reference. Additionally, he gave an overview of the Composition and Terms of Office of IUPAC leadership. This information concerned items relating to Titular members, Officers and

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membership of Standing Committees and Sub-Committees terms of service and Committee make-up. The Centenary Endowment Board policy outlines the composition and term of Centenary Endowment Board members and additional details. Mr. Humphris referred to the Agenda book for detailed information on the Endowment Board proposal, specifically three individuals for this purpose.

**11. REPORTS FROM DIVISIONS AND STANDING COMMITTEES**

**11.1 FOUR-YEAR ELECTION CYCLE FOR DIVISIONS/COMMITTEES**

Prof. Brett referred to Prof. Hutton for his proposal to discuss the election cycle change from two years to four years, specifically referring to Division Officers and Standing Committee Chairs. It was his position that the lengthened term would allow for time to become familiar with their roles and cut down on the laborious task of elections as frequently.

**11.2 RECORDS RETENTION INFORMATION GATHERING (THIS IS TO FOLLOW UP TO THE ACTIVITY INITIATED OUT OF THE EXECUTIVE COMMITTEE LAST FALL)**

Ms. McEwen presented on the CPCDS Subcommittee on Records & Archives, its priority areas and the need in divisions and standing committees to identify types of records. She also proposed a records questionnaire concerning Activities, Records, and other issues. She asked that it be completed on a voluntary basis by 14 May 2021.

**11.3 DRAFT GUIDANCE ON DATA MANAGEMENT FOR IUPAC PROJECTS (THIS FILLS AN ESSENTIAL GAP THAT BRINGS CRITICAL DATA OUTPUTS IN LINE WITH GUIDANCE FOR OTHER SCIENTIFIC OUTLETS)**

Ms. McEwen presented guidance on data management of IUPAC projects. They have presented challenges. For additional information and details, she referred Bureau members to the documentation in the Agenda book.

**11.4 PROPOSAL FOR A DEDICATED DISCUSSION AT THE GA ON THE FUTURE OF CPCDS AND IUPAC INFRASTRUCTURE FOR SUPPORTING DIGITAL WORK AND ORGANIZATIONAL STRUCTURAL REVIEW)**

Ms. McEwen discussed CPCDS and infrastructure of digital work for IUPAC outcomes, assets, and value observations. Additional information was available for review in the Agenda book. She discussed inventory, guidance, use cases and strategy. Ms. McEwen additionally asked if CPCDS could propose a special retreat or meeting of the Bureau in the Fall of 2021 to invite discussion on possible strategies for IUPAC infrastructure supporting digital work. Ms. McEwen invited all to submit information and questions or comments to her for discussion and consideration.

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11.5 WORLD CHEMISTRY CONGRESS (ACADEMIC INPUT, FUNDING OF SYMPOSIA, AND USE OF DIVISION/PROJECT FUNDING)

Prof. Garelick presented the 2021 Congresses logo and discussed the NAO holding the General Assembly and the offerings given by the NAO Country. She also discussed allocation of funds for projects and requesting funding from host NAO's. Prof. Garelick mentioned voting on project allocation and the final decision made by the division. Her concern was clarification regarding the rules for this process.

11.6 LEVEL OF AUTONOMY DIVISIONS SHOULD HAVE OVER APPROVED/PRE-APPROVED PROJECTS

This item was covered in a previous discussion point.

**10:55 AM ADJOURN DAY 1**

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**SATURDAY 17 APRIL 2021**

**08:00 AM**

11.7 SUPPORT AND ADVICE TO THE PROJECT NO. 2020-011-2-041

Prof. Tundo, task group (interim) chair for ICGCSD, made a request for support and advice on the above project. He spoke about the project spanning nearly all divisions and committees. Division 5 and Division 7 are the only ones which were not included in the project. He also emphasized that those divisions missing were important to the work. Prof. Tundo spoke on the many tasks which are to be competed and the needs of each of the tasks. He outlined the many benefits of the project. The milestones of the project were also important to note. Additional information on these items can be found in the Agenda book.

11.8 NATIONAL REPRESENTATIVES FOR ICGCSD

Prof. Tundo emphasized the need for additional National Representatives for the ICGCSD and discussed the request from NAO's to have additional National Representatives for the ICGCSD. Prof. Hartshorn commented that the statutes and bylaws will need to be drafted to allow for approve of a proposal, which will be needed to put before the Council. Prof. Brett reiterated that 10 is the maximum allowable representative on an interdivisional committee. The general consensus is that 10 representatives would be an appropriate number for this committee.

**Motion:** *The Bureau approved a recommendation to Council of the approved number of members 8 NR's for the IGCSCD.*

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**12. (VIRTUAL) GENERAL ASSEMBLY & CONGRESS, MONTREAL CANADA**

**12.1 THE PROPOSED OUTLINE OF THE VIRTUAL GA AND WCC**

Dr. Soby presented information on the timing of the WCC and division and standing committees in which there will be no overlap to allow for individuals who would like to attend and participate in more than one session. Dr. Soby also gave a preview of the format for Awards and Exhibitors and how they will be shown throughout the Congress. There will be exhibitors who are expecting to have corporate sponsorships, e.g. De Gruyter. There will be a poster session platform with chat functions and virtual exhibition booths for individuals to attend. An important aspect of the Congress will be for attendees to have the ability to build their own schedule and interact with one another in those sessions. Sessions using an app called Gather Town will be helpful to attendees. In addition, Dr. Soby reiterated that exhibitors will have virtual rooms where attendees will be able to interact with them. Division and committee meetings will have sessions after each meeting for social networking and engagement opportunities, e.g. IYCN and Bureau members. There is a rough scheduling grid which will be available shortly to the Bureau members.

**13. WCLM UPDATE**

Prof. Ober gave a preview of the theme of the WCLM, being a format including six short recorded talks relating to the impact of artificial intelligence on chemistry. He noted that after the plenary talks, six prerecorded presentations forming the basis of panel discussions and those talks will give rise to live talks later in the meeting to discuss and debate the recorded talks. Additional information is available in the Agenda book.

**14. YOUNG OBSERVERS PROGRAM/IYCN**

Dr. Lynn Soby spoke about the IYCN's meeting at the GA and that they intend to have a meeting of the young scientists and young chemists together. The observers and participants will be able to attend the meetings as usual, though it will be virtual.

**15. ELECTION UPDATE**

**15.1 OFFICER NOMINATION (VICE PRESIDENT/TREASURER/BUREAU)**

Dr. Soby noted that they will be using Election Runner for the votes on these officer nominations. The officer nominations are numerous for Bureau, but of concern was that there are no nominations for Treasurer and both Mr. Humphris and Dr. Soby were encouraging members of the Bureau to reach out to the NAO's for nominations and suggestions for this critical role.

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***ACTION:*** Colin will be writing to individuals to encourage nominations and interest.

## 16. STATUTES AND BYLAWS

### 16.1 SPECIAL COUNCIL MEETING (TO VOTE ON VIRTUAL COUNCIL MEETINGS AND ELECTRONIC VOTING) 5 MAY 2021

There has been approval of standing committees in to deliberate on changes to the statutes and bylaws to enable a virtual, hybrid or in-person council meeting.

**Motion:** *The Bureau unanimously approved the recommendation to Council of the creation of a standing Committee on Equity, Diversity, Ethics and Inclusion.*

### 16.2 A SPECIAL COUNCIL MEETING ON 5 MAY 2021

A special Council Meeting has been approved to enable a virtual voting process on Council meetings and electronic voting in the future.

## 17. DIVISION RULES

There was no new information to report on this item.

## 18. REPORTS FROM BUREAU COMMITTEES

### 18.1 EVALUATION COMMITTEE, MEMBERSHIP RELATIONS COMMITTEE, SOLVAY AWARD

Dr. Zhou and Dr. Soby noted that due to the pandemic, there have been not many issues relating to new members aside from Uzbekistan, who is interested in applying for NAO status with IUPAC. Of note, there was also some interest in The Philippines to join as NAO, as well. Prof. Brett emphasized the need to use Bureau contacts to encourage AMP's, CA's and NAO's.

### 18.2 SOLVAY AWARD

Prof. Zhou discussed the 2021 results of the Solvay Award with the Bureau. There thirty-six candidates and five awardees, with 3 honorable mentions. The rules and criteria of multinational coverage required by this award were received as highly respected. The Solvay Award has been renewed through 2025.

## 19. IYBSSD

Prof. Hartshorn discussed the status of the memorandums of understanding, and it was proposed by IUPAP for the IYSBBD to take place in 2022. It was approved by UNESCO in the 40<sup>th</sup> Session of the General Conference in November 2019. The letters of support came from about 50 academies from around the world and twenty-seven Nobel Laureates and Fields Medalists. It will likely be delayed

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until later in the time period already stated. There is more information in the detailed Agenda book for review by the Bureau members.

Prof. Hartshorn referred to the expansion of the Division Emeritus Fellows Program. The proposal to expand the program is detailed in the Agenda book. It details that each of IUPAC Division would have its own group of Emeritus Fellows and will be responsible for managing that group and involving them appropriately in the work of the Division.

**20. “ON” ORGANIZATIONS**

20.1 INTERNATIONAL SCIENCE COUNCIL

Prof. Brett commented on the activities in 2019 and 2020 awards and the 2018 review conference.

20.2 OPCW

Prof. Brett discussed the collaboration of Green Chemistry, Sustainability and Outreach. The next review conference is in 2023.

**21. BID PROPOSALS FOR 2027**

21.1 BID PROPOSALS

Dr. Soby received four letters of intention from NAO's to bid on hosting the 2027 General Assembly. however, only three, Canada, Czech and Slovakia and Russian Chemical Society are still active. These will be considered and voted upon at Council. Additional information is available in the Agenda book on requirements including the application in draft form from the Netherlands.

**22. DATE/TIME OF NEXT BUREAU MEETING(S)**

Prof. Brett announced the next proposed day for pre-council Bureau Council meeting on 10 July 2021, but the date would not work. Prof. Brett suggested a Doodle Poll for the next Bureau meeting.

**23. ANY OTHER BUSINESS**

The terms of reference of a the newly approved CIDEI Standing Committee brought to Bureau during the meeting, there will be some additional emphasis on the core and values of IUPAC in the language. Prof. García Martínez will circulate the final terminology to the Bureau in advance of the next Bureau meeting.

**ADJOURN 10:18 AM**

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**THESE MINUTES ARE VERIFIED TO BE ACCURATE AND CORRECT.**

**DATE** \_\_\_\_\_

**PROF. CHRISTOPHER BRETT- SECRETARIAT GENERAL**

**DATE** \_\_\_\_\_

**DR. LYNN SOBY- RECORDED SECRETARY**



## **Minutes of the 103<sup>rd</sup> IUPAC Bureau Meetings July 9<sup>th</sup> and July 12<sup>th</sup>, 2019**

**Palais des Congrès de Paris, 2  
Place de la Porte Maillot, 75017  
Room 351  
Paris, France**

**Attendees:** Prof. Qi-Feng Zhou (Chair), Prof. Natalia Tarasova, Prof. Christopher Brett, Prof. Richard Hartshorn, Mr. Colin Humphris, Dr. Lynn Soby, (Executive Director), Prof. Russell J. Boyd, Prof. Mei-Hung Chiu, Prof. Javier Garcia Martinez, Prof. Mary Garson, Prof. Hemda Garelick, Prof. Ehud Kienan, Prof. Christopher K. Ober, Prof. Pietro Tundo, Prof. Ken Sakai, Prof. Ron Weir, Prof. Lars Ohrström, Prof. Francesco Nicotra, Prof. Greg Russell, Prof. Zoltán Mester, Dr. Rai Kookana, Prof. Rita Cornelis, Prof. Alan Hutton, Prof. Jan Apotheker, Dr. Carolyn Ribes, Dr. Carlos Tollinche, Ms. Bonnie Lawlor, Prof. Jurgen Stohner.

**Guests:** Prof. Doug Templeton, Prof. Jan Reedijk, Dr. Fabienne Meyers, Leah McEwen, Michelle Rogers, Saha Arandam

**Secretary:** Ms. Bonnie Lawlor

\*\*\*\*\*

### **1. Introductory Remarks and Welcome**

IUPAC President, Professor Qi-Feng Zhou, opened the meeting at 2:05pm with a welcome and thank you to all present. He noted that that today's session was scheduled to end at 4:40pm and that the Bureau would resume discussions on Friday, July 12<sup>th</sup> beginning at 8:30am. He then requested that the Secretary General chair the Bureau meeting.

Professor Richard Hartshorn, IUPAC Secretary General, noted that during today's session it was essential that the Bureau resolve all issues related to discussions at Council so that everyone was prepared. At the Bureau's session on July 12<sup>th</sup> the Bureau will focus on issues that emerged from Council discussions and the results of the elections.

### **2. Finalization of the Agenda**

Members of the Bureau were asked if there were any suggested additions to the agenda that was circulated prior to the meeting. It was noted that a paper from the Interdivisional Committee on

Green Chemistry for Sustainable Development (ICGCSD) will be discussed in the Bureau on Friday as an item under “Any Other Business.” The paper was emailed to Bureau members on July 9, 2019. The content of the paper has implications on another IUPAC Division.

Before moving on to the next agenda item several other issues were briefly discussed. First was an update on the health of Karl-Heinz Hellwich, Past-President of Division VIII. It was reported that he is still in a coma as a result of his cerebral hemorrhage and that a slow recovery is expected. All present expressed concern for his health and best wishes for a recovery.

Second, Professor Greg Russell, President of Division IV, asked about the original agreement for NAO representation from China. Dr. Lynn Soby, IUPAC Executive Director, said that this is an ongoing challenge and most recently she had to deal with it in regards to the Periodic Table of Younger Chemists on which the flag of each chemists’ country is displayed. She looked back to documents from the 1970’s and found that in 1978 a document was signed that permitted two organizations from the same country to serve as NAO’s. Currently, for China the two NAO’s are the Chinese Chemical Society and the Chemical Society of Taipei. Lynn added that this is a very complex issue. Pietro Tundo, Chair of ICGSD, said that a phrase sometimes used for such joint representations is “two organizations from the same countries and/or economies”

### **3. Minutes of the 97<sup>th</sup> and 98<sup>th</sup> Meetings of the Bureau**

Professor Richard Hartshorn asked if there were any corrections to the minutes of 101<sup>st</sup> meeting of the IUPAC Bureau that was held in Bratislava, Slovakia, 7-8 April 2018. There being none he **MOVED**

that the minutes of 101<sup>st</sup> meeting of the IUPAC Bureau that was held in Bratislava, Slovakia, 7-8 April 2018 be approved as submitted.

The motion was seconded and unanimously approved. Similarly, the minutes of the 102<sup>nd</sup> meeting of the IUPAC Bureau that was held via teleconference on 6 April 2019 were approved without comment.

### **4. Minutes of the 155<sup>th</sup> Meeting of the IUPAC Executive Committee**

The minutes of the 155<sup>th</sup> meeting of the IUPAC Executive Committee were provided for information. The minutes of the 156<sup>th</sup> meeting of the IUPAC Executive Committee that was held in London, UK 18-19 November 2017 and the 157<sup>th</sup> meeting of the IUPAC Executive Committee that was held in Alcala, Spain 8-9 November 2018 were presented to the Bureau and there were no comments.

### **5. Minutes of the 49<sup>th</sup> Meeting of the Council**

The final minutes of the 49<sup>th</sup> meeting of the IUPAC Council were included in the Council Agenda book. They will be approved by Council at the meeting on July 10<sup>th</sup>. No comments and/or changes were made.

## **6. Action Items from Previous Meetings**

The Bureau had been asked to review the action items in the Council papers and note any changes. For information, updated action items were provided and no comments were made.

## **7. Report of the President**

IUPAC President, Professor Qi-Feng Zhou, reported briefly on the challenges and accomplishments of the Union in the current biennium. The full report is in the Council Agenda Book, a summary of which is as follows: “To further implement the Strategic Plan, IUPAC has taken the following steps: introduced new programs for different categories of members; approved a new National Subscription model; improved project management and Division/Committee operations; taken initiatives in cheminformatics and chemistry for sustainable development; and engaged more with the younger generation and strengthened collaboration with other international organizations. Apart from making continuous scientific contributions, volunteers in Divisions and Committees also actively participated in celebrations of both the IUPAC Centenary and IYPT2019 that have been organized by Union bodies and NAOs. To celebrate our 100-year history also offers a good opportunity to review the Union’s overall conditions and to think about its future.”

In closing, Professor Zhou asked if there were any questions and/or comments in preparation for the Council meeting. There being none, he thanked everyone for their attention and requested that if any comments or questions arise later to please send them to him prior to the Council meeting that opens tomorrow. He also thanked everyone present, indeed all IUPAC volunteers, for their work on behalf of the Union.

## **8. Report of the Secretary General**

Professor Richard Hartshorn, IUPAC Secretary General, noted that his report is included in the Council Agenda Book. At Council he will report on the operations of the Secretariat and on initiatives taken to advance the work of the Union. The main topics are the following: the Secretariat staffing and workload (few people and a lot of work); conference endorsements and gender balance (we need to ensure that conference organizers make an effort to recruit expert speakers across all genders); his visits to Division and Committee meetings; strategic relationships for IUPAC; and procedural issues (election processes, operation/policy manuals, etc.). Richard asked for comments. There being none, he requested that members of the Bureau please send any later thoughts - both comments and/or questions - to him prior to the Council meeting tomorrow morning.

## **9. Vice President’s Critical Assessment**

Professor Christopher Brett, IUPAC Vice President/President-Elect, submitted his critical assessment to the Bureau earlier this year on 6 April 2019. It is also included in the Council Agenda book. His report examines IUPAC’s activities within the context of the IUPAC strategic plan and mission. It addresses the future development of IUPAC and its scientific priorities for responding to challenges in the chemistry community and globally, as well as ensuring the

legacy of the IUPAC Centenary and the International Year of the Periodic Table. It also discusses the planned review of the IUPAC structure to ensure that the Union can effectively respond to future scientific challenges and maintain ongoing organizational sustainability. Professor Brett asked for comments. There being none, he requested that members of the Bureau please send any later thoughts - both comments and/or questions - to him prior to the Council meeting tomorrow morning.

## **10. Financial Matters**

Mr. Colin Humphris, IUPAC Treasurer, gave a report on the organization's financial situation. He noted that the Union is still solvent and that the current financial problems are fixable. He referred to the options paper and noted that the baseline budget projected a biennium loss of approximately \$500K, but that the strategic budget cuts that loss in half. One of the goals of the revised budget is to ensure that Projects and the key work of the Union is funded and continues. He added, however, that going forward the Union needs to change how it does its work. Governance can be done virtually via Go-to-Meetings and similar software offerings. Meetings in off-years can be handled virtually and perhaps the General Assemblies can be longer and more expansive, allowing more face-to-face interaction. Colin noted that the work of the Treasurer is to prepare the budget and act on behalf of the NAO's. He expressed concern about IUPAC's two major revenue streams - dues from NAO's and subscription fees for publications. We need to provide value to our NAO's in order to maintain their loyalty. He added that he is concerned about Plan S. This is an initiative for Open Access publishing that was launched in September 2018. The plan is supported by coalition S, an international consortium of research funders. Plan S requires that, from 2021 (initially it was 2020, but implementation has been delayed for one year), scientific publications that result from research funded by public grants must be published in compliant Open Access journals or platforms. We do not know if/how this initiative will impact our revenue from *Pure and Applied Chemistry (PAC)*. It was noted that the full Treasurer's report as well as the Finance Committee reports from February 2018 and February 2019 are in the Council Agenda Book. Also included in the Council Agenda Book are the following financial documents: the audited financial statements for 2017 and 2018; the proposed budgets for 2020-2021 - P&L statement; and the proposed Division and Committee Allocations for 2020-2021. Colin asked if there were any questions and/or comments. There were none.

## **11. 2019 IUPAC Centenary**

Professor Mary Garson provided a brief update on activities related to IUPAC's 100<sup>th</sup> anniversary. The major events are the following: the Global women's breakfast that took place earlier this year; the creation of a Periodic Table that honored younger chemists; the Periodic Table Challenge - an online trivia contest; and the development of stories that demonstrated IUPAC's many contributions over the past one hundred years. All of these very successful activities are highlighted on the IUPAC100 website at: <https://iupac.org/100/>. Mary added that the women's breakfast was so successful that it will be repeated in 2020 on February 12<sup>th</sup>. She encouraged all present to attend the IUPAC100 Celebration that will take place at 10:30am in the main auditorium of the Palais des Congrès de Paris.

## 12. *PAC* and *CI* with De Gruyter

Mr. Colin Humphris reported on the status of IUPAC's publications, *Pure and Applied Chemistry (PAC)* and *Chemistry International (CI)* that are created in partnership with the publishing company, De Gruyter. He reported that *PAC* has been back on track with content since 2017 (there were some content pipeline problems during 2016 that resulted in the creation of two double issues with only ten physical products being shipped, not the twelve that were budgeted). There were twelve solid issues in 2018 and we are on target to do the same this year. The production of *PAC* is relatively smooth, in part due to the monthly teleconferences with De Gruyter. The major challenge for *PAC* is the recruitment of reviewers for the manuscripts and the assistance of Division Presidents would be much appreciated. It was noted that the *PAC* Editorial Board met earlier this week on Monday, July 8<sup>th</sup> and plans are being developed to celebrate *PAC*'s 60<sup>th</sup> anniversary in 2020.

With regard to *Chemistry International*, the content pipeline is solid thanks to the efforts of the Editor, Fabienne Meyers, and a very active Editorial Board that meets monthly. Some production problems remain, but this is strictly due to the fact that *CI* is a news journal and the De Gruyter production system was built to accommodate scholarly journals. With *CI* only being published four times a year in print format, the Board has been looking at ways to cost-effectively develop a digital platform so that there can be more frequent engagement with IUPAC members as well as the broader scientific community. This is particularly important since the contract with De Gruyter will expire at the end of 2020 and we need to decide if it is to be renewed or if IUPAC needs to take a different path. Colin also highlighted a new initiative that was launched this year in *CI* and that is the identification of the Top Ten Emerging Technologies in Chemistry that was suggested by Javier Garcia. The results of that project were published in an article in the April 2019 issue (it has been the most downloaded *CI* article so far this year) and the initiative will be repeated in 2020. Colin asked both Ms. Bonnie Lawlor, a member of the *CI* Editorial Board, and Dr. Fabienne Meyers, *CI* Editor, if they wanted to add anything. Bonnie said that Colin's summary covered the key points.

## 13. Conferences and Symposia

There was nothing discussed.

Before the meeting was adjourned for the day, there was a brief discussion about the proposed discontinuation of the IUPAC Committee on Chemical Research Applied to World Needs (CHEMRAWN). The Committee, founded in 1973, met this week with the IUPAC President, Secretary General, Treasurer, and Christopher Brett, Chair of the Evaluation Committee. All of them assured the Committee that CHEMRAWN's key activities will continue. Professor Brett provided the results of the Evaluation Committee's review of the Committee and there was a brief discussion among Bureau members. This issue will be brought to Council for a vote at this meeting.

There being no further discussion, today's meeting of the IUPAC Bureau was adjourned at 4:10pm to be resumed at 8:30am on Friday, July 14<sup>th</sup> with agenda item number 14.

Professor Richard Hartshorn re-convened the Bureau on July 12, 2019 at 8:30am. He welcomed new Bureau members who were attending as observers. He encouraged them to actively participate in the discussions but reminded them that they cannot vote at this meeting.

#### **14. Election of Bureau Representatives to the Executive Committee**

The first item of business was the election of Bureau representatives to the Executive Committee (EC). Professor Hartshorn noted that the election will close at 11:30am.

#### **15. Matters Arising from Council and their Resolution**

##### *Item #1: Election of Bureau Members to the Executive Committee*

First, it was noted that Prof. Mei-Hung Chu's EC slot needs to be filled as does that of Prof. Javier Garcia-Martinez since he was elected as Vice President during the Council meeting. Whoever replaces Javier will have a four-year term. Two positions need to be filled. The elected members of the Bureau that have been nominated to fill the slots on the Executive Committee are as follows: Prof. Mei-Hung Chu (China/Taipei), Prof. Russell Boyd (Canada), Petr Fedotov (Russia), and Bipul Behari Saha (India). Note that the successful nominees were Prof. Mei-Hung Chu and Prof. Russell Boyd.

##### *Item #2: Task Force to Examine IUPAC's Structure*

A second matter is that the Executive Committee (EC) needs to establish a Task Force to examine IUPAC's structure. This will be an EC project. There was a brief discussion regarding the composition of the Task Force. Colin Humphris said that he did contact Bureau members on this issue prior to the General Assembly. Their input was to serve as the basis for a broader survey. Ron Weir suggested that the Task Force have about five members. Jan Apotheker suggested that at least two people be from outside IUPAC and at least one person be included who knows the current structure well. Jürgen Stohner suggested that the NAO's be involved. Zoltan Mester said that the key drivers should be the stakeholders. In our case this would be the NAO's and he agreed with Jürgen that there should be an NAO representative. We should encourage the NAO's to flesh out their collective vision of IUPAC. Chris Brett suggested that Colin's survey to the Bureau members be sent to the NAO's. Colin agreed that the NAO's must be engaged in the process. It was also suggested that there be industry input and Zoltan said that we should get someone from industry that uses our information. Prof. Roi Kookana suggested that there be a young person on the Task Force (under the age of 40) and Dr. Fabienne Meyers suggested that someone from the International Younger Chemists Network (IYCN) be identified. Also, it was noted that diversity be considered as the Task Force is put together.

Mary Garson said that the Task Force will need someone to help coordinate the paperwork that will be needed and Richard Hartshorn noted that the Secretariat is already overburdened. Prof. Natalia Tarasova suggested that we get input from other Unions and suggested that we use the World Science Forum as a venue. It is scheduled to take place in Budapest, Hungary from November 20-23, 2019 and Colin Humphris will be attending.

Dr. Carolyn Ribes noted that the American Chemical Society (ACS) just did a review of their structure and she will see if she can get them to share their report.

**ACTION: Dr. Carolyn Ribes** will see if she can get the American Chemical Society (ACS) to share the results of their governance structure review.

Ron Weir said that it is essential to get the analysis right. Carolyn Ribes added that the communication both of the process and the end result is equally important. We will need a communication plan.

Some names of potential Task Force members were put forth. These were as follows: Mark Cesa (led the recent IUPAC Strategic Planning effort); Peter Mahaffy (active in chemical education); Brandon Presley (young member of Division VII); Bonnie Lawlor (outgoing Chair of CPCDS); Michael Droescher (industry); Patrick Maestro (Chief Science Officer at Solvay); Natalie LaFranzo (under 40, industry, and served on the ACS governance study team); Lori Ferrins; and Javier Garcia as incoming Vice President). Richard Hartshorn asked for additional feedback no later than July 31, 2019. The issues on which he would like feedback are: the form, size, and makeup of the Task Force; suggested participants (keeping diversity in mind); and the topics that the Task Force members should address - what do they need to know?

**ACTION: All Bureau members** will provide Richard Hartshorn with any additional suggestions that they may have regarding the Task Force on IUPAC Governance structure no later than July 31, 2019.

**ACTION: Prof. Chris Ober** will identify someone at Cornell University to design a survey for the Task Force but will need to know the topics on which the Task Force wants feedback.

**ACTION: Mr. Colin Humphris** will circulate the results of his survey to all Bureau members.

Javier Garcia commented that both the CHEMRAWN issue and funding constrained our celebrating here in Paris. He said that we need to focus on how we can be more relevant. Colin noted that this initiative must move forward quickly with the results finalized by February 2021. He also noted that the effort is *not* a focus on structure, but rather a focus on ensuring that IUPAC is relevant, sustainable, effective, and efficient.

### *Item #3: Recommendation for Standing Committee Chairs*

It was noted that Council voted the Chairs of all Standing Committees onto the Bureau.

## **16. Items from the Meeting of Division Presidents**

Prof. Greg Russell provided a summary of the key issues that emerged from the Division Presidents' meeting:

### *Feedback on Division/Standing Committee 2019 Elections*

- The Nomination procedure should better address the suitability of candidates for the specific work that is needed to be done within Divisions and Standing Committees
- Are position descriptions sent to NAOs? (the answer was “yes if we have them.”)
- Is there a general set of guidelines about suitability of candidates that is sent to NAOs?
- Webpage with NAO form?
- Role of Division Presidents in elections is murky and variable

*Feedback on the 2019 General Assembly (GA), including IYCN Speed Networking and Considerations for the 2021 GA/World Chemistry Congress*

- Tea/coffee/water inadequate
- Some rooms were too hot, some too cold
- Finding rooms at the meeting site was very difficult
- Lack of power-points
- Too much co-scheduling - frequently people had two or more simultaneous commitments
- Mixed feedback on speed networking as a way of mixing
- We need better interaction between different parts of IUPAC, between IUPAC and WCC, and between IUPAC and the Program Committee

Prof. Mary Garson said that IUPAC needs to have more input with regards to the diversity of plenary speakers at future Congresses.

*Feedback on the IUPAC website, specifically Division/Committee Pages*

- The website is going well!
- All would like to see email addresses made public (this is a privacy issue and individuals must opt-in to make their address public)
- Some website managers are still not trained
- Can IUPAC websites be linked with Twitter feeds?
- The IUPAC Facebook page is not up-to-date. IUPAC uses Twitter a lot with success, but this really only captures the population of one age group. Younger people use Instagram, and Facebook is still widely-used. In reality IUPAC needs to be on all three platforms if it wants to engage with all ages (social media platforms for consideration are Twitter, Facebook, Instagram, and LinkedIn)

*Feedback on Division rules*

- Division Rules should be living documents rather than one-offs
- Some groups did not like having sections on rules for removing people (but some did!)

This generated some discussion. It was noted that Division Rules will always need to be updated, but they must be approved by the Council. Ron Weir said that it is good to have rules for removing people because then there is something to fall back on when absolutely needed.

*Feedback on Emeritus Membership*

- At the meeting those present voted for the name “Emeritus Fellows” (EFs) rather than “Honorary Fellows”
- EFs should have automatic status in ICTNS (Jürgen Stohner said that ICTNS relies on emeritus members)
- Could there be one set of rules for EFs across all Divisions and Standing Committees? The group looked at Division VII’s EF rules, which were believed to be good, but perhaps a bit too technical
- At universities, emeritus status is for the whole university rather than just a part of the university. Could we do this in IUPAC too?
- Similarly, university departments suggest an emeritus, but the status is conferred by the head of the University. Could Divisions and Standing Committees suggest EFs, but have the status conferred by letter from the Secretary General, as is done with conference endorsements?
- Stuart Chalk agreed to prepare a proposal on having Digital Fellows/Observers as a means of recruiting computer-savvy chemists into IUPAC.

**ACTION:** *Greg Russell* will draft a template for the development of rules for Emeritus Fellows.

**ACTION:** *Greg Russell* will formally reach out to Richard Hartshorn about having Emeritus status applied to all of IUPAC rather than only to the Division/Standing Committee who recommends the emeritus status.

#### *Feedback on IUPAC100 activities*

- The International Younger Chemists Network (IYCN) is important for the future (of IUPAC)
- The 2019 WCC opening was unacceptably “gender imbalanced”

#### *Feedback on the Gold Book*

- Stuart Chalk presented the results of his project to update the Gold Book website. The next step is to have Divisions update the content. There was a vigorous discussion on this topic and ICTNS will lead the effort. Stuart is drafting two new proposals to facilitate the updating process.
- Concern about linking the Gold Book and the other Color Books

#### *Feedback on Future Bureau Meetings*

- There were mixed views on the desirability of face-to-face meetings in off-years
- Potential suggestions for saving money:
  - Hold General Assemblies every three years rather than every other year?
  - Do not pay in full for the Titular Members of Divisions and Standing Committees to attend General; Assemblies?

- The IUPAC Secretariat keeps track of what other conferences Bureau members are attending, and alerts them to meet when “critical mass” is going to be in the same place, e.g. ACS meetings, EuChemS meetings, etc.

In closing, Prof. Russell noted that the newly-elected Chair for the next meeting of Division Presidents and Standing Committee Chairs is Lars Öhrström (Div. II).

#### **17. Report from the Membership Relations Committee**

Prof. Natalia Tarasova gave a brief presentation on the meeting of the Membership Relations Committee that took place on July 9<sup>th</sup>. The group recommended that when registering for the Congress non-members have an option to become an Affiliate Member. This was done this year with some success. The key is to retain members and we need to be more relevant, especially to the younger generation. There were no comments or questions.

#### **18. Report from the Project Committee**

Prof. Doug Templeton noted that the Committee met on July 9<sup>th</sup>. He said that he had no further comments beyond what was included in his report in the Council Agenda Book. He did add, however, that interdivisional projects are given a high priority and that the final date for submission of projects in this biennium is October 21, 2019.

#### **19. Report from the Evaluation Committee**

Prof. Christopher Brett also noted that his Committee met on July 9<sup>th</sup>. He said that he had no further comments beyond what was included in his report in the Council Agenda Book.

#### **20. Reports from Divisions and Standing Committees**

All of the written reports were included in the Council Agenda Book and brief oral reports were presented during the Council meeting. There were no questions and or comments on those reports at this meeting.

#### **21. World Chemistry Leadership Meeting (WCLM)**

Prof. Chris Ober gave a brief summary of the 2019 World Chemistry Leadership Meeting (WCLM). He noted that in the future we need to be more diverse and he gave thanks to Jean-Pierre Vairon for organizing the Congress. Chris was asked to develop a proposal for the 2021 WCLM since he has extensive experience organizing the session. He was congratulated on a very successful event.

**ACTION:** *Prof. Chris Ober* will develop a draft proposal for the 2021 World Chemistry Leadership Meeting (WCLM).

## **22. PhosAgro Project**

Prof. Natalia Tarasova provided some information on the current status and future of the PhosAgro Project. This Green Chemistry for Life Project was launched in 2013 by UNESCO's International Basic Sciences Program and PhosAgro, the largest producer of phosphate-based fertilizer globally, in close cooperation with IUPAC. The program was launched by the three partners as a follow-up to the 2011 International Year of Chemistry. The goal of this Grant program is to support young scientists whose research projects adhere to the twelve principles of green chemistry. Young scientists up to age 39 with a PhD degree (or equivalent) in chemistry or similar areas are eligible. Funding over the past six years has totaled USD 2.5 million to support annual research grants. An International Competition has been held each year since 2014. It was noted that six General Awards are made each year and one Special Award for work on a project related to phosphogypsum has been added since 2017. The International Jury meets at UNESCO headquarters in Paris in May each year. The Grant Program has been a prospective and successful project. During five years it has attracted six hundred applications from around the world. Thirty-four awards have been made to young scientists from twenty-six different countries. The International Scientific Jury for Green Chemistry for Life is comprised of prominent chemistry scientists, teachers, and researchers. The high level of the International Jury competence ensures an unbiased and thorough examination of the submitted applications. The call for applications for the 2019 Awards closes August 31, 2019.

## **23. Future General Assemblies and Congresses**

The 51<sup>st</sup> General Assembly and 48<sup>th</sup> Congress will take place in 2021 in Montreal, Canada. The 52nd General Assembly and 49<sup>th</sup> Congress will take place in 2023 at The Hague, The Netherlands. The 53<sup>rd</sup> General Assembly and 50<sup>th</sup> Congress will take place in 2025 in Kuala Lumpur, Malaysia.

## **24. Affiliate Membership Program**

The Affiliate Membership Program was briefly discussed. Mr. Colin Humphris noted that the success of the program varies by country and region.

## **25. IUPAC-Solvay International Award for Young Chemists**

Prof. Natalia Tarasova provided some information on the 2019 IUPAC-Solvay International Award for Young Chemists. The Award is intended to encourage outstanding young research scientists at the beginning of their careers and are given for the most outstanding Ph.D. theses in the general area of the chemical sciences, as described in a 1000-word essay. The award is generously sponsored by Solvay. The theses are scored as follows: Scoring, from 0 to 100 (100 being the best score), is given for the following qualities of the applications:

- (a) Excellence and relevance to current research in the chemical sciences: 0-30
- (b) Relevance and quality of the applicants' scientific background, including publications: 0-30
- (c) Scientific and applied significance of the expected results: 0-30

(d) Relevance and quality of the home/host institute 0-10

The assessments of these qualities could be based on the following approximate scoring: excellent (100-91), very good (90-81), good (80-61), fairly good (60-51), not good enough (50-41), not acceptable (less than 40).

For the 2019 Awards there were twenty-eight applications, six from females. There were eleven applications from China/Beijing plus China/Taipei (of them one was female and three of them received a PhD from Chinese (or Taipei) universities. From the USA two applicants have U.S. citizenship and eight applicants received degrees from the U.S. universities. The winners included four males and one female, and they represented China/Beijing, China/Taipei, and the USA.

In 2020 up to five prizes will be awarded and will be presented at the 2021 IUPAC Congress in Montreal. Each Awardee will be invited to present a poster on his/her research and to participate in a plenary award session. They are also expected to submit a review article for publication in *Pure and Applied Chemistry*.

Natalia noted that diversity is an issue and that we need more applications from women. We also need to ensure continuity of the jury members and we may need more Bureau members to serve if the number of applications increase.

## 26. Dates and Place of Next Bureau Meeting

The next Bureau meeting will be held in April 2020 and will be held virtually.

## 27. Any Other Business and Closing Remarks

The paper from the Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD) that was circulated earlier this week was raised. Richard Hartshorn requested that members of the Bureau carefully read the document and that it will be discussed via email.

**ACTION:** *All members of the Bureau* are to carefully read the paper from the Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD) that was circulated earlier this week. It will be discussed via email after the close of the Congress.

In closing, IUPAC President, Professor Qi-Feng Zhou thanked everyone for their active participation, not only in the many meetings that took place during the past week, but for also contributing to IUPAC's very successful 100th anniversary celebration. He adjourned the meeting at 10:50am.

# International Union of Pure and Applied Chemistry

104<sup>th</sup> MEETING OF BUREAU

VIRTUAL MEETING 25 APRIL 2020

## MINUTES

Attendees: Prof. Christopher Brett (Chair), Prof. Javier García-Martínez (Vice President), Prof. Richard Hartshorn (Secretary General), Mr. Colin Humphris (Treasurer), Prof. Qi-Feng Zhou (Past President), Prof. Russell J. Boyd, Prof. Mary Garson, Prof. Christopher K. Ober, Prof. Ken Sakai, Prof. Ghada Bassioni, Prof. Mei-Hung Chiu, Dr. Petr Fedotov, Prof. Ehud Keinan, Dr. Bipul Behari Saha, Dr. Tim Wallington, Prof. Lars R. Ohrström, Prof. Nikolay E. Nifantiev, Prof. Christine Luscombe, Dr. Zoltán Mester, Prof. Hemda Garelick, Dr. Rita Cornelis, Prof. Alan Hutton, Prof. Jan Apotheker, Prof. Francesca Kerton, Dr. Robert Audette, Ms. Leah McEwen, Prof. Pietro Tundo, Prof. Jürgen Stohner

Guest: Dr. Lynn Soby (Executive Director), Dr. Fabienne Meyers (Associate Director)  
Dr. Laura McConnell, Prof. Jan Reedijk

Secretary: Lisa Musty

Apologies: Prof. Gloria Obuzor

**SATURDAY 25 APRIL 2020**

### 1. INTRODUCTORY REMARKS AND WELCOME

Professor Christopher Brett welcomed all participants and thanked them for joining the virtual meeting. He announced the virtual meeting format for off-year Bureau meetings and commented on the world situation due to the pandemic. Professor Brett further discussed the timing of the meeting and keeping to a timeline. He announced that some of the Divisions and Standing Committees have already met and asked all participants to introduce themselves, including titles and Bureau position.

### 2. FINALIZATION OF AGENDA

Professor Christopher Brett referred members to both the short agenda and the long agenda, which included items which needed to be previously reviewed and asked for additional topics. Dr. Zoltán Mester requested that everyone agree to meeting recording and Professor Brett asked if anyone objected to having the meeting recorded. All members agreed to the recording.

### 3. MINUTES OF 103<sup>RD</sup> MEETING OF THE BUREAU (PARIS, APRIL 2019)

Professor Christopher Brett brought the Bureau's attention to the minutes of the 103<sup>rd</sup> meeting of the Bureau included in the Agenda book and asked if there were any questions or comments. Leah McEwen noted that under item 6.7 the SDS Subcommittee should be corrected to SCDS Subcommittee. As there were no other comments, Professor Brett asked Bureau members to vote via the chat function of the virtual meeting application.

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DECISION:

*The Bureau approved the Minutes of the 103rd (Paris) meeting.*

*28 – Yes; 0 – No; 2 – Abstain*

3.1 MATTERS ARISING FROM MINUTES (NOT COVERED BY ITEMS ON AGENDA)

No matters arising from the minutes were raised.

**4. MINUTES OF 158<sup>TH</sup> EC MEETING**

4.1 RECEIPT OF DRAFT EXECUTIVE COMMITTEE MINUTES BY BUREAU

The Secretary General noted that a draft of the 158<sup>th</sup> Executive Committee meeting minutes was not available for inclusion in the Agenda book. The Consolidated List of Actions were included in the Agenda Book and asked if there were any comments. There were no comments and the minutes were received by the Bureau.

**158<sup>th</sup> Executive Committee, Tokyo 2019 Consolidated List of Actions and Decisions**

[158EC2] Minutes of the 157<sup>th</sup> Executive Committee were noted as previously approved.

[158EC3] Draft minutes of the 103<sup>rd</sup> Bureau minutes were received and approved to seek Bureau approval.

[158EC4] The EC approved the membership of the Organization Review group proposed membership list. The EC also confirmed that Prof. Brett continue as the liaison to the group.

[158EC5] During the discussion of the Establishment of an Endowment mechanism, the Treasurer and Vice President noted that a new narrative be created to communicate to an external audience the unique value proposition of IUPAC relative to many other organizations. *[No Person Assigned]*

[158EC6] The Treasurer and Executive Director will develop a formal Travel and Expense policy and present to Bureau at the 2020 meeting for approval. *[CH/LMS]*

[158EC9.1] The EC approved the recommendation to adopt a new category “Associate National Organizations” and continue promoting the benefits of coordinating the IUPAC Affiliate Member program and the IUPAC Company Associate Program.

[158EC9.2] The EC approved the recommendation to formally terminate the Sponsored Affiliate Member program for 2020 onwards. A discounted membership of \$15.00 should be offered to lower income Associate National Organization countries.

[158EC9.3] The Treasurer and Executive Director will continue working the ANO details in order to propose to Council a replacement of the ANAO program after detailed review of the ability to pay in BRICS countries. *[CH/LMS]*

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[158EC13] The EC approved the proposal to extend Division Emeritus Fellows to other IUPAC Divisions in order to harmonize the program.

[158EC14] The EC approved the Division Committee Rosters that were delegated to the EC for exceptional circumstances.

[158 EC16] The EC approved the proposed IUPAC Representatives “ON” other organizations for both the IUPAC and Division representatives.

[158EC21] The EC approved the CIAAW Press Release.

[158EC20] The EC ratified the conference endorsements as of 30 November.

4.2 HIGHLIGHTS AND QUESTIONS ABOUT EXECUTIVE COMMITTEE ITEMS NOT ON THE BUREAU AGENDA

There were no questions about items from the minutes of the Executive Committee.

**5. MINUTES OF 50<sup>TH</sup> MEETING OF COUNCIL**

5.1 RECEIPT OF DRAFT EXECUTIVE COMMITTEE MINUTES BY BUREAU

The Secretary General noted that the draft of the 50<sup>th</sup> Executive Committee meeting minutes were not available for inclusion in the Agenda book. The Consolidated List of Actions were included in the Agenda book for reference and he asked if there were any comments. There were no comments and the List of Decisions and Actions were received by the Bureau.

**6. ACTION ITEMS FROM PREVIOUS MEETINGS NOT COVERED ON AGENDA**

Professor Richard Hartshorn noted that several items from the previous meeting of the Bureau would be covered in the Agenda. There were no questions or comments.

**7. REPORT OF THE PRESIDENT**

Professor Christopher Brett referred to his report included in the Agenda book. He noted highlights which included streamlined activities of IUPAC, increased visibility and the importance of projects put out by each committee. He emphasized the necessity of visibility of IUPAC as the worldwide resource for chemistry. Professor Brett called for continued efforts to link with external organizations, with specific emphasis on environmental sustainability and efforts toward reducing the global environmental crisis. He also discussed chemistry data to be presented in a universal format and encouraged members to thoroughly review the report, if they had not done so. He mentioned the United Nation Secretary General’s statements on the global health crisis and the need for IUPAC to

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continue to provide hard data toward that end. He asked for any questions or comments on his report and there were none.

**8. VICE PRESIDENT'S CRITICAL ASSESSMENT**

Professor Javier García-Martínez discussed the challenges of the Union and stated he will continue to be in contact with Bureau members for critical assessments, including discussions with the Evaluation Committee for review of efficiency. Professor Martínez additionally discussed promoting changes in recruiting young scientists and the necessity of finding balance with rigorous scientific work and accurate and quick responses to the needs for scientific data in chemistry. He noted his concerns about IUPAC becoming irrelevant and the current financial situation. He continued by mentioning scientific meeting challenges in person which were cancelled and postponed due to current pandemic and asked for feedback in writing or other communication.

Professor Christopher Ober commented to Professor Martínez regarding reopening research labs, and Robert Audette responded that they continue to function as essential in industry. He suggested that IUPAC publish information on protection and procedures to continue to safely operate laboratories in a rapid manner.

Professor Martínez thanked everyone for their input and reinforced the need for IUPAC to use the opportunity presented by the Covid-19 pandemic to further IUPAC visibility and chemistry initiatives.

Zoltán Mester commented that IUPAC has been largely silent in how to handle issues relating to the Covid-19 pandemic and quality chemical testing. He noted that this would be an additional opportunity to provide unbiased chemical testing information.

Professor Nikolay Nifantiev mentioned the possibility of IUPAC collaboration with the WHO and the opportunities such a situation provided for IUPAC.

Professor Martínez commented that some one-page instruction sheets exist, including one specifically circulated from Dow Chemicals, and encouraged individuals to communicate with him to offer simple and concrete guidelines for chemical handling.

**ACTION:**

*During the Vice President's critical assessment of the challenges of the Union, JGM agreed to contact Bureau members regarding initiation of the Evaluation Committee's review of efficacy and needs of the Union. He will request feedback in writing or other communication from Bureau members [JGM]*

**9. REPORT OF THE SECRETARY GENERAL**

Professor Richard Hartshorn introduced the specific issue of Gender Balance of invited speakers in conferences seeking IUPAC endorsement, which has not improved satisfactorily. He stated that a major challenge was that some organizing committees were not making this a sufficient priority. He suggested that a greater emphasis on giving up and coming scientists plenary opportunities at such

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conferences might lead to a reduction in this problem. He noted that many IUPAC committees would be meeting by teleconference and other virtual means and offered to participate in those meetings if those groups thought it may be useful for him to do so.

Laura McConnell made comments on the Global Women's Breakfast and suggested creating a document to provide guidance on how to create gender balance beyond current members.

Leah McEwen commented that she wants to assist with gender balance on plenary speakers at conferences and other focus areas of IUPAC representation.

Hemda Garelick suggested that the Bureau look at finding lists of women who are prominent in the Chemistry field. Her belief is that varied geography is important in this aspect for IUPAC.

ACTION:

*Secretary General and Executive Director will collaborate on furthering gender balance on plenary speakers at conferences, etc. [RH/LMS]*

**10. REPORTS FROM DIVISIONS AND STANDING COMMITTEES**

10.1 DIV 1 – TIM WALLINGTON

Dr. Tim Wallington reported on progress in the past two years on bringing projects in the division up to date. The Division was represented at the General Assembly in Paris with thirteen representatives and engaged in lively discussions during the meetings. He highlighted the completion of the 4<sup>th</sup> edition of the Green Book, which is now in review. Division 1 is already planning for a 5<sup>th</sup> edition of the Green Book that will be a digital narrative and is currently working on the project that is updating the Gold Book.

10.2 DIV 2 – LARS OHRSTRÖM

Professor Ohrström discussed the past year of Division 2 as extremely busy with both elections and the International Year of the Periodic Table activities. He also reported on the Division's progress on revisions of atomic weights which are out for review in *Pure and Applied Chemistry*. Additionally, he reported a new interest in projects relating to the concept of valence and other materials in inorganic chemistry.

10.3 DIV 3 – NIKOLAY NIFANTIEV

Professor Nikolay Nifantiev referred Bureau members to his Division 3 report in the Agenda book for detailed information. He reported on various Division 3 activities including the participation in IUPAC collaboration with Organization for Prohibition of Chemical Weapons (OPCW), ongoing project management and scientific advances. He reported about work on management structure, participation in five subcommittees and eight Conferences in the past year.

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### 10.4 DIV 4 – CHRISTINE LUSCOMBE

Professor Christine Luscombe opened with comments on the excitement about the postponed 48<sup>th</sup> World Polymers Conference, Macro 2020+ and the recent announcement of awards which will be presented at the conference in 2021.

### 10.5 DIV 5 – ZOLTÁN MESTER

Professor Zoltán Mester referred Bureau members to the detailed report included in the Agenda book and emphasized the Division structure and goals. Additionally, he emphasized some of the goals of Division 5, to encourage the growth of Analytical Chemistry and to provide the highest level of scientific advice. The Division is also working on launching an international chemistry award.

### 10.6 DIV 6 – HEMDA GARELICK

Professor Hemda Garelick discussed the Division 6 interest in a multi-disciplinary approach and the use of varied expertise in the area of processes in environmental systems, health and scientific aspects of food, agriculture and crops. The Division is using life cycle analysis of chemicals to help research end of life processes and their related effects on the environment. Additionally, Professor Garelick reported on several activities and collaborations which include studying nano-enabled pesticides, flame retardants and microplastics and in particular, studying their long-term impact on the environment. Division VI was involved in several symposia, conferences and proposals over the past two years. It proposed 3 symposia to the Montreal Congress planning committee.

### 10.7 DIV 7 – RITA CORNELIS

Dr. Rita Cornelis provided a summary of Division 7 projects and activities during the past biennium, including a Symposium on Drug Discovery and Development, the production of a manuscript submitted to ICTNS for publication and a project focused on the glossary of terms used in combinatorial chemistry, which is in final draft form. Professor Cornelis also summarized several additional projects and publications. Chairs of two Subcommittees were elected and membership of 3 Subcommittees were renewed.

### 10.8 DIV 8 – ALAN HUTTON

Professor Alan Hutton drew Bureau's attention to a new collaborative project, building on the Division's long-standing liaison with ISO, entitled 'Nomenclature and associated terminology for inorganic nanoscale particles'. He gave additional details on Brief Guides to chemical nomenclature that were newly published in several languages in four-page brochure format as well as the originals in Pure and Applied Chemistry. Key priorities for the future include new editions of the Red Book and the Principles of Chemical Nomenclature. Professor Hutton also gave an update on the health of Karl-Heinz Hellwich, current Titular Member and former Past President of the Division, who has been gravely ill but is now embarking on a slow recovery.

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10.9 CHEMRAWN – FRANCESCA KERTON

For ChemRAWN, the Committee on Chemical Research Applied to World Needs, Professor Francesca Kerton discussed future initiatives and collaborations on awards, additional IUPAC Committees currently working on building capacity through chemistry research and training, and social media awareness. She additionally highlighted the need to improve interdivisional interactions and collaborations globally. Other activities which are ongoing include the use of virtual technologies to promote awareness of chemical research.

Mr. Colin Humphris requested to be added to the ChemRAWN invite list and Professor Kerton agreed to do so.

ACTION:

*Colin Humphris, as Treasurer and an ex-officio member of ChemRAWN is to be added to all ChemRAWN invites [FK]*

10.10 COCI – ROBERT AUDETTE

Colin Humphris indicated he was working on increasing the global chemical industry's participation in IUPAC. Colin was interested in having COCI's involvement in this important IUPAC effort. Dr. Robert Audette indicated that he was actively working on proposed new COCI goals and objectives for 2020-2021. The 1st new goal and objective was to re-initiate and increase the global chemical industry and pharmaceutical industry, including chemical industry associations, back into active participation within COCI. Dr. Audette agreed to collaborate closely with Mr. Humphris on this important IUPAC and COCI initiative. *\*Dr. Audette resigned as Chair of COCI shortly after the Bureau meeting. Dr. Anna Makarova was appointed Chair and Dr. Bipul Saha appointed Secretary by the President after consultation with the Executive Committee. The Action item below reflects the current membership.*

ACTION:

*Colin Humphris, as Treasurer, and Dr. Saha, as COCI Secretary, will collaborate to increase the global chemical industry and pharmaceutical industry, including chemical industry associations, active participation in IUPAC and COCI. [CH, BS]*

10.11 CCE – JAN APOTHEKER

Professor Jan Apotheker reported on a number of projects completed, including a project about gender gap and chemistry education. He also commented on the role of chemistry in development. The Periodic Table Challenge was extremely successful, and he noted that over 130 countries participated in the Challenge. Ongoing items related to this are relaunching the PT Challenge “2.0” on the IUPAC website. He noted upcoming conferences planned for ICCE and discussed publishing a special issue of *Chemistry Teacher International*, in cooperation with the other Divisions. He referred Bureau members to the report in the Agenda book for additional details.

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10.12 ICTNS – JÜRGEN STOHNER

Professor Jürgen Stohner discussed that ICTNS updates guidelines on technical reports, recommendations and revising entries in The Gold Book. He also referred to his own report in the most recent publication. Additionally, he mentioned IUPAC sponsored books reviewed by ICTNS. Finally, he commented that the review of publications (time spent under review, number of revisions etc.) is more thorough than he originally expected and within the limits of past years.

10.13 CPCDS – LEAH MCEWEN

Ms. Leah McEwen reported on a new program on emerging technologies and highlighted the opportunity of research in the digital era. She also discussed raising the public awareness of “Digital IUPAC” and specifications necessary for projects and a substantial online presence. She emphasized the exchange of research data in the digital era and collaborating with digital media on publications. Ms. McEwen spoke briefly on the challenges of researching drug sequencing in regard to the Covid-19 work. Additionally, she stated priorities for CPCDS continue to be establishing standard metadata profiles for machine-readable expression of data and creating digital workflows and tools.

10.14 ICGCSD – PIETRO TUNDO

Professor Pietro Tundo gave updates on the Interdivisional Committee on Green Chemistry for Sustainable Development, including new members and nominations. He further noted his concern that there are only 8 core members (Chair, Secretary, 3 TM and 3AM) and emphasized the need for partnerships and coordination of efforts around green chemistry. Additionally, the 1<sup>st</sup> virtual meeting of this Committee was held in January 2020. Professor Tundo gave a summary of several awards and prizes awarded, including PhosAgro/UNESCO/IUPAC, IUPAC-NHU Award and ChemRAWN VII Prize in Green Chemistry. He also discussed the Metrics for Green Synthesis and correlating IUPAC projects with the UN-SDG's.

**11. ADDITIONAL ICGCSD MATTERS**

11.1 STATEMENT TO BUREAU

Christopher Brett requested that Professor Pietro Tundo, Standing Committee Chair, summarize the proposed statement of ICGCSD. The full statement was in the Bureau Agenda book. Professor Tundo introduced the statement to the Bureau:

*“While we pay attention to the increasing emission of CO<sub>2</sub> and the increasing number of new chemical compounds that are spreading in the environment, it is difficult to foresee an end to this damaging trend. Because Nature is not in a hurry, but humankind is.”*

Professor Brett requested questions from Bureau members and Professor Hemda Garelick commented that the statement needs additional discussion and collaboration. Additionally, she

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noted the need to define Green Chemistry more carefully by the Bureau. Javier Martínez and Colin Humphris also had comments regarding the difference between Sustainable Development and Green Chemistry. Discussion commenced around the terminology of “Green Chemistry” and Christopher Brett requested that there be an electronic vote on the statement at a later date, as a consensus is needed. All agreed that more discussions were required before a vote can be made.

**ACTION:**

*The ICGCSD statement regarding “Green Chemistry” needs additional discussion and a vote via electronic methods will be held in the future. [PT/RH/CB/HG]*

**11.2 NHU AWARD RENEWAL**

Professor Tundo then gave an overview on the NHU-IUPAC Award renewal in March of 2020, which will be presented at the 47<sup>th</sup> IUPAC World Chemistry Congress and General Assembly in Montreal, Canada, in 2021. This will be the second such award for Advancements in Green Chemistry.

**11.3 UNSDGs PROJECT**

Professor Pietro Tundo gave a review of the task group on proposal #2020-011-1 which is also found summarized in the Agenda book.

Christopher Brett asked for questions on Committee Reports. Colin Humphris referred to a question about COCI from Robert Audette and they agreed to discuss the item in an offline conversation. No additional questions were raised.

**12. ITEMS FROM MEETING OF DIVISION PRESIDENTS**

**12.1 DIVISION EMERITUS FELLOWS**

Professor Richard Hartshorn discussed the status of the Division Emeritus Fellows Program. He referred to the proposal to expand the program, included in the Agenda book. It details that each of IUPAC Division would have its own group of Emeritus Fellows and will be responsible for managing that group and involving them appropriately in the work of the Division.

**13. COVID-19 AND IUPAC CONFERENCES**

Professor Richard Hartshorn informed the Bureau about numerous IUPAC conferences which were either postponed or cancelled due to the Covid-19 pandemic. He expressed concern about future issues of *Pure and Applied Chemistry* (PAC) due to a lack of these events and collaborations that may cause a shortage of materials for publication. Professor Hartshorn suggested the Bureau consider alternative sources of materials and themed issues of PAC.

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Professor Martínez discussed that the Covid-19 pandemic may provide new subject content for publications. He stated that additional discussion online is needed.

Professor Christopher Ober mentioned the possibility of publishing student review papers written during the Covid-19 pandemic.

Professor Nikolay Nifantiev commented that student articles may not be of interest to the community if it is student driven. Profs. Ghada Bassioni and Jurgen Stohner also commented on this topic regarding young and inexperienced scientific writing.

**14. 2021 51<sup>ST</sup> GENERAL ASSEMBLY & 48<sup>TH</sup> CONGRESS, MONTREAL**

Dr. Lynn Soby announced her support of the conference application submitted for approval and also noted that the application was included in the Agenda book. She commented on the importance of having greater diversity at the 51<sup>st</sup> IUPAC General Assembly and 48<sup>th</sup> Congress and expanding upon earlier plans to ensure it. Lynn additionally gave details from her review of the location and facilities.

Mr. Colin Humphris commented that Division Presidents and Committee Chairs should make great efforts to encourage the newer members of IUPAC to attend the General Assembly in 2021.

*DECISION: Bureau unanimously approved the Application for IUPAC Endorsement (AIE) submitted by the Chemical Institute of Canada and National Research Council of Canada for the 2021 World Chemistry Congress.*

*Yes – 32; No – 0; Abstain – 0*

**The Bureau took a short break from 11:45AM to 11:55 AM (Mary Garson departed the meeting and announced that Laura McConnell would take her additional items on the agenda).**

**15. IUPAC ORGANIZATIONAL STRUCTURE REVIEW GROUP REPORT**

Professor Javier Martínez reported that the IUPAC Organizational Structure Review Group is reviewing organizational structure and financial spending, including pressures on the Secretariat's costs. The report could include short, medium, and long-term recommendations and changes.

Leah McEwen commented that, in addition to increasing efficiency, how we work also has implications for dissemination, access, adoption and managing IUPAC's outputs.

Christopher Brett commented that there was a lot of ground to cover before October of this year, with the review group making its recommendations to the Executive Committee by November 2020. He also recommended collaboration of Bureau members with the Review Group when requested and asked the Bureau to consider what they would like to see happen as IUPAC begins its second century.

**16. FINANCE AND BUDGETS**

*Summary*

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Mr. Colin Humphris, Treasurer, referred to the IUPAC 2018-2019 Biennium P&L, included in the Agenda book. He reviewed the biennial balance sheet, line of credit and cash flow report, with emphasis on capital gains and losses, publication income, and Budget allocations. Colin Humphris noted that both he and Lynn Soby would be available to answer questions regarding the Finance Committee's report. Also mentioned was the unpredictability of the current financial environment, and a major economic downturn would definitely affect IUPAC income and investments. The summary profit and loss statement for 2019 is included in the Agenda book. The data make comparison between 2019 Actual and the original 2019 budget together with commentary to aid understanding. Looking at 2019, a higher expected cost in a General Assembly year and 2018 (off year) actuals gives a complete biennium picture.

The overall biennium result is a loss of 58k USD but this is net of an unrealized gain on the value of IUPAC's investments of 297k USD. Therefore, at an operating level the loss was 355k USD largely accounted for by the fact that at the end of the biennium IUPAC had borrowings of 337k USD.

The 2019 year-end balance of the total portfolio was 4,476,402.00 USD and, as seen in the P&L, had significant "unrealized" gains throughout 2019. The total balance as of March 31, 2020 was 3,754,273 USD which represents a loss of 721,992 USD between January 31st and March 31st.

Also reviewed were publication income and budget allocations for 2020/2021.

Lynn Soby reported that Secretariat staff have been working remotely and will continue to do so for the near future due to the Covid-19 pandemic.

Christopher Brett asked Colin Humphris about travel expenses and to expand on the explanation on the travel information per diem rates. Colin Humphris gave the explanation that per diem rates are universal and exclude local travel charges.

## **17. TRAVEL AND EXPENSE POLICY REVIEW**

Lynn Soby summarized the Travel and Expense Policy and referred Bureau members to the report included in the Agenda book. She emphasized the necessity of approving the new policy so that Claim form structure and instructions can be updated.

### *DECISION:*

*Bureau unanimously approved the new 2020 Travel and Expense Policy [All]  
Yes – 27; No – 0; Abstain - 0*

## **18. AUDITED FINANCIAL STATEMENT AND STATUS**

Colin Humphris referred Bureau members to the 2019 Financial Audited Statements included in the Agenda book for reference. He announced that the Audit was clean and correct. Additionally, development of more policies is important for both the volunteers and the IUPAC Centenary Endowment Fund. There were no questions or comments on the report.

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**19. CENTENARY ENDOWMENT STATUS**

Colin Humphris reported that the Endowment Policy review is available and thanked the Endowment Committee for soliciting advice on the legal, scientific and investment aspects. Colin also mentioned that IUPAC could potentially attain sponsorship for the Periodic Table Challenge. He reported that the Centenary Endowment Board would be an external board with the roles of soliciting funds from members of the International chemistry community and seeking other philanthropic major donors. He referred Bureau members to the documents contained in the Agenda book and commented that the first meeting should take place prior to the Montreal General Assembly meeting in 2021.

*DECISION:*

*The Bureau approves the Centenary Endowment Fund draft resolution documents to enable the Treasurer and Executive Director to progress the next steps in formation of the Fund and its Board.*

*Yes – 27; No – 0; Abstain - 0*

**20. APPLICATIONS FOR NATIONAL ADHERING ORGANIZATION STATUS**

Lynn Soby reported that there were no additional applications for IUPAC NAOs. Additionally, she encouraged Bureau members to reach out to their respective countries and NAOs to encourage increased collaboration with IUPAC and transferring their 2020 National Subscription.

**21. PUBLICATIONS**

Colin Humphris reminded the Bureau of the necessity for a future agreement to continue with DeGruyter and that the termination date of the current contract is December 31, 2021.

Additionally, he reported that the *Chemistry International* editorial board continues to meet regularly to ensure the flow of relevant and interesting content. A workgroup is looking at ways to bring *CI* digitally to a larger audience. DeGruyter will continue to work on proposals to this end.

Professor Jan Apotheker mentioned including *Chemistry Teacher International* in the consideration of digital publications and future materials.

**22. STATUS REPORT ON IUPAC SECRETARIAT**

Dr. Soby introduced the Bureau members to Lisa Musty, the Secretariat's new staff member responsible for assisting the Executive Director and program management of the multiple membership programs. Bureau members welcomed Lisa to IUPAC.

**23. REPORT OF IUPAC100 CENTENARY**

In the absence of Professor Mary Garson, Dr. Laura McConnell, guest of the Bureau meeting, presented a summary of the celebration of the IUPAC Centenary. Many IUPAC conferences and

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symposia were part of the IUPAC 100, as well as the Periodic Table Challenge, which will continue to provide exposure and engagement activities on the IUPAC website. The Periodic Table of Younger Chemists, PTYC is a specific joint initiative with IYCN and honored 118 younger chemists, each representing an element in the Periodic Table. The website for this celebration of IUPAC is on <https://iupac.org/100/>.

Javier Martínez expressed his appreciation on the success of IUPAC 100, 2020 Global Women's Breakfast and the multiple legacies of the 2019 efforts.

### 23.1 GLOBAL WOMEN'S BREAKFAST 2020

Laura McConnell discussed the reach and scope of the Global Women's Breakfast and the Centenary. She congratulated Mary Garson on the success of the 2020 Women's Global Breakfast. Additional comments on the reach and scope were made by several Bureau members. Lynn Soby commented that it was a great success and videos were recorded and displayed on the IUPAC website and IUPAC's social media.

Lynn Soby commented that Bureau members were encouraged to look for additional sponsorship opportunities for next year's GWB.

## 24. REPORT ON IYPT 2019

Professor Jan Reedijk reported on UNESCO activities and referred Bureau members to the summary, including a financial report and youth activities.

Dr. Bipul Saha gave a summary of the IYPT activities in India and informed that discussion on implementation of International Year of Basic Sciences for Sustainable Development (IYBSSD) has already been initiated.

## 25. INTERNATIONAL YEAR OF BASIC SCIENCES FOR SUSTAINABLE DEVELOPMENT

Professor Christopher Brett announced that The International Union of Pure and Applied Physics has proposed an International Year of Basic Sciences for Sustainable Development. Professor Brett noted that this must be approved by the UN General Assembly. The IUPAP must sign a memoranda of understanding (MoU) with its partners which would include the amount of funding to be contributed by IUPAC. He emphasized attracting young people to basic sciences in the future. He additionally offered to answer questions now or in the future.

## 26. BUREAU COMMITTEE REPORTS

### 26.1 REPORT OF THE MEMBERSHIP RELATIONS COMMITTEE

Professor Qi-Feng Zou reported on the analysis being made of how IUPAC might serve its members better and comparing with what is done by other unions. He mentioned the International Mathematical Union and the International Union of Physics in his report in the Agenda book.

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26.2 REPORT OF THE IUPAC COMMITTEE FOR ISC

Professor Qi-Feng Zou reported on the activities of the ISC. The ISC launched an online hub for the Covid-19 pandemic. He highlighted ISC action plan items and research as well as sharing best practices.

26.3 REPORT OF THE IUPAC-SOLVAY AWARD COMMITTEE

Professor Qi-Feng Zhou reported on the 2020 IUPAC Solvay Awards, which include winners from Vietnam, China, Israel, India and Canada and 3 honorable mentions from a total of 7 countries, including a good gender balance of 5 males and 3 females. He additionally noted that this year had better diversity than previous years and that Solvay was happy with the results. Professor Zhou also thanked the team members and Committee.

26.4 REPORT FROM PROJECT COMMITTEE

Professor Jan Reedijk provided a summary of project funding for scientific conferences. He noted that projects are evaluated based on their capability to span multiple divisions, and the willingness of the divisions to give these projects funding support. Professor Reedijk also reported that the project committee budget increased from 70k USD to 90k USD.

26.5 REPORT FROM EVALUATION COMMITTEE

Javier Martínez reported on communication and feedback from members of the Evaluation Committee.

**27. PROJECTS IN REVIEW**

Dr. Fabienne Meyers referred Bureau members to the Proposals in Review available to them in the Agenda book. She further explained how the proposals are tracked and centrally located in IUPAC systems. She gave additional information on the format and numbering of the proposals listed, how they are assigned and approved. Fabienne additionally commented that reports are shared monthly and contain a summary of all current project balances.

Professor Hartshorn mentioned that DP's and STCC should be sure the project reports are submitted accurately and in a timely manner.

27.1 INTELLECTUAL PROPERTY

Lynn Soby presented the Bureau with information regarding the endorsement of an intellectual property guideline for IUPAC, to include rights for a book, compilation, video and other items to be considered. Additionally, Lynn also noted that members on the Bureau are included in the financial reports to the US Internal Revenue Service.

Christopher Brett suggested having an additional discussion on this topic and a vote at a later date and Bureau members agreed.

104<sup>th</sup> MEETING OF BUREAU  
MINUTES

ACTION:

*Lynn Soby will discuss this item with Bonnie Lawlor and report back to the Bureau for further input and voting. [LS]*

**28. CONFERENCE ENDORSEMENT PROGRAM**

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**29. INCHI TRUST**

Richard Hartshorn referred Bureau members to review the report included in the Agenda book.

**30. OPCW INTERACTIONS**

Professor Brett reported on IUPAC work with the Organization for the Prohibition of Chemical Weapons (OPCW) on the peaceful uses of chemistry. A 2019 Hague Award was given to IUPAC in recognition of the collaboration with OPCW since 1997. He noted that Professor Hartshorn has helped coordinate and increase the interactions with OPCW through various IUPAC Divisions.

Professor Hemda Garelick gave an overview of the recent discussions on education, analytical chemistry and the environment with OPCW in Paris and a proposal made to OPCW regarding collaboration on those three topics. She will provide a summary of the meeting in the next month.

Colin Humphris asked if there were current plans on how to spend OPCW funds awarded to IUPAC.

Lynn Soby stated that the award has been designated as unrestricted funds but is being held as restricted, pending determination of how IUPAC will use the funds. The officers were encouraged to discuss this at later time.

**31. DATE OF 105<sup>TH</sup> BUREAU MEETING**

Professor Brett announced that the next Bureau meeting will be held in early 2021, specifically April 17<sup>th</sup>, 2021, with April 10<sup>th</sup>, 2021 serving as an alternative date and asked if there were any conflicts. The Bureau agreed on those dates.

**32. ANY OTHER BUSINESS**

Professor Nikolay Nifantiev proposed two questions for additional Bureau discussion. The first topic concerns endorsed conferences, which was already addressed in the discussion of item 13.

The second is IUPAC collaboration with WHO. Bureau members briefly discussed agreements and Colin Humphris noted the importance of finding useful projects for proposals, as this is the model preferred by WHO and other similar international organizations.

**THE MEETING WAS ADJOURNED AT 13:58**

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**33. APPENDIX FOR COMPLETED ACTION ITEM DOCUMENTATION**

**THE FILES INCLUDED IN THIS SECTION REFER TO SPECIFIC ACTION ITEMS THAT HAVE BEEN COMPLETED AND NEED TO BE MINUTED AS COMPLETE.**

# **International Union of Pure and Applied Chemistry**

## **158<sup>th</sup> MEETING OF EXECUTIVE COMMITTEE**

Tokyo, Japan, December 6, 2019

APPROVED MINUTES

### **1. INTRODUCTORY REMARKS AND FINALIZATION OF AGENDA**

Attendees: Prof. Qi-Feng Zhou (Chair), Prof. Christopher Brett, Prof. Natalia Tarasova, Prof. Richard Hartshorn, Mr. Colin Humphris, Dr. Lynn Soby, Prof. Mei-Hung Chiu, Prof. Christopher K. Ober

Guest: Ms. Minjie Huang

Secretary: Dr. Lynn Soby (Executive Director)

Prof. Qi-Feng Zhou welcomed all participants and members of the Executive Committee (EC) and thanked the Chemical Society of Japan for hosting the meeting for the arrangements and support for IUPAC.

Prof. Zhou then asked Prof. Hartshorn to chair the meeting. No additional items were added to the Agenda.

### **2. MINUTES OF 157<sup>TH</sup> (MADRID, 17-18 NOV 2018) MEETING OF EXECUTIVE COMMITTEE**

Minutes of the 157<sup>th</sup> Executive Committee were noted as previously approved.

### **3. MINUTES OF 103<sup>RD</sup> MEETING OF THE BUREAU (PARIS, 9 AND 12 JULY 2019)**

#### **3.1 RECEIPT OF MINUTES BY EC**

Draft minutes of the 103<sup>rd</sup> Bureau minutes were received by the EC and approved to seek Bureau approval.

### **4. PROGRESS ON ESTABLISHMENT OF THE REVIEW GROUP**

At the 50th General Assembly of IUPAC in Paris, Council approved a motion for the Executive Committee to establish a working group by the 1st January 2020 to undertake a complete review of the organizational structure of IUPAC.

On 19 July, Our Treasurer Mr. Colin Humphris provided a draft letter to go to the NAOs as a first step in ensuring their full engagement in the review, and a new draft was made by Secretary General Prof. Richard Hartshorn based on that from Colin and the comments from EC members. This letter followed by a questionnaire will be sent to NAOs for their input and fully active engagement.

On 3 September, Richard restarted the conversations around the structure and establishment of the review group. A quick response was first made by Colin who offered his initial suggestions that formed a good base for further discussions by all EC members.

Prof. Brett, working with Dr. Cesa proposed the membership of the Review Group for EC decision. The suggested membership was a combination of “internal” and “external” members, and diversity was taken in consideration. The EC also confirmed that Prof. Brett continue as the liaison to the group.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

- Mark Cesa, Chair (USA)
- Javier Garcia-Martinez (Spain) Vice President IUPAC
- Ito Chao (China/Taipei)
- Michael Droeschler (Germany)
- Lori Ferrins (IYCN) (Australia)
- Zhi-Gang Shuai (China/Beijing)

#### 5. STRATEGIC ISSUES FOR THE NEXT BIENNIUM

**PROF. BRETT**

Prof. Brett outlined his view of how the IUPAC strategy should develop over the next biennium. Appropriate measures need to be taken so that the results of the important IYPT events of the last year, which have captured the enthusiasm of the chemical and scientific community and the public at large, are not lost. We also need to increase the effectiveness of collaboration both inside and outside IUPAC.

Inside IUPAC we need to find ways to increase information exchange. All of us from officers through to task groups need to be tuned to work together and not duplicate efforts and use resources efficiently. We must devise ways, early on in the biennium, to minimize the impact of not having face-to-face meetings in the divisions and standing committees, the executive committee and in bureau, using this as an opportunity to streamline our operations.

Outside IUPAC, we need to increase our visibility worldwide. In IUPAC conferences, the interventions of the IUPAC representative have not always had sufficient impact. We should all explore all the opportunities that arise for dissemination, particularly focusing on those that represent how we can respond to challenges to chemistry and collaborate in responding to them, demonstrating our crucial role. We should all be communicating the same IUPAC message, and be reaching out to those parts of the world where the impact of IUPAC is less clear. For this purpose, a fully up-to-date speaker pack and accessory information is very important. We need to have a strong voice, as has happened with UNESCO and OPCW, and make our mark in all relevant international organizations in a way that is pertinent and useful to the scientific community and society.

To consolidate the legacy of IYPT and the centenary, we need to continue with worldwide activities, such as the global breakfast, which will take place in 2020. He suggested action items include enhancing communications and updating the IUPAC Presentation, update contacts with external organizations and engagement with their programs, particularly ISC.

#### 6. FINANCE AND BUDGETS

**MR. HUMPHRIS/DR. SOBY**

##### 6.1 REPORT ON CURRENT FINANCIAL SITUATION (CF 2018-2019 BUDGET)

Colin Humphris referred to the financial items in the Detailed Agenda and Agenda Book for details. *All financial information presented at the EC meeting and contained in the Agenda and documents were pre-Audit and is subject to change.*

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

The approved minutes from the 2019 Finance Committee (FC) are included for reference to the Financial items. The Income Statement and Balance sheet as of 30 October 2019 are included in the Agenda book. IUPAC continued reporting on a full accrual basis which continues to provide great insight into the financial performance of the Union and importantly its cash needs.

Mr. Humphris stressed the need for the Executive Committee members to review and gain an understanding of the P&L, as they provide a comprehensive review of the financial health and outlook for IUPAC.

In 2018 we recorded a loss of \$368k in the Profit and Loss account that included an unrealized loss on the investment portfolio of \$210k. To end October 2019, we show a profit of \$304k but this includes an unrealized gain of \$522k so we are in deficit at the operating level i.e. excluding unrealized gains and losses. To the end of the year we will expect to see publication income close to plan with the end year payment from DeGruyter but otherwise the bulk of invoiced income is already shown. We have two months of operating costs to record including inevitably some late claims for the GA.

The bottom line was that in this biennium we will be close to breakeven or showing a small deficit the reason for us taking action within the budget for 2020 and 2021.

The Executive was asked to note the Main Messages looking at the P&L as of 30 October:

- NAO income was below plan following the loss of Brazil and Pakistan offsetting the gain of Singapore
- Growth in income from CA's and AMP's still lag behind our budgetary hopes
- Our Secretariat and Administrative costs are in budget overall
- Our Travel and Subsistence expenditure was well below budget
- Balance sheet shows cash available was \$96,472 (after exclusion of cash sweeps within the investment portfolio) in comparison with Accounts Payable of \$42,365.
- Accounts receivables from primarily NAOs was much healthier than in 2018 with \$115,136 owing.
- EC members should note that the website and database projects have moved from Work in Progress (WIP) to implementation and depreciation.
- The short-term notes payable was our line of credit that was fully utilized at \$350k. In September, the Finance Committee approved the extension of the line of Credit to \$500k given persistent cash flow issues through the year but have avoided extending our borrowing beyond \$350k. A full cash flow report was included in the Agenda book for reference.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

#### 6.1.1 Overview of GA and IUPAC100

The 2019 GA Budget Expectation was that Paris would be more expensive than Sao Paulo for travel and subsistence. From the P&L, it was noted that the travel and subsistence was below budget expectations. Anticipated extra expenses were for IUPAC100 (50k), Council Room/Food (40k), WCLM (21k). While some items were still being reconciled to actual expenses over the year, it was anticipated to remain under budget for the GA and IUPAC100 Activities (not covered within projects).

#### 6.2 PERFORMANCE OF INVESTMENT PORTFOLIO

The balance sheet also showed the recovery of the value of investment portfolio to the value in October 2018. The Finance Committee remains satisfied with the performance of our advisors BB&T and reconfirmed our investment criteria at the meeting in September 2019.

#### 6.3 ESTABLISHMENT OF ENDOWMENT MECHANISM

The Council (Paris, 2019) approved the future appointment of the Centenary Endowment Fund Board of Directors including external Directors by the Executive Committee. Council also approved the Executive Committee to progress in the formation of the fund and its guiding documents. The law firm of Manning and Fulton were contacted to develop an Endowment Agreement and Guidelines necessary for the creation of the Endowment Fund. Additional papers for donations are also being crafted. We are working through the initial drafts of the documents. The IUPAC investment firm, BB&T/Scott & Stringfellow, provided their perspective to the Finance Committee on the membership of the external members, stating that the BOD will need “star power” Nobel Laureate-type reputation, a C-level individual from a major Chemical company and another with legal background.

The Treasurer and Executive Director are currently reviewing the initial documents from our legal firm, which include a resolution that will require approval of the Executive Committee. This resolution outlines how the BOD will function. The intention is that the BOD members serve as volunteers for IUPAC and not require funds to participate. Regular meetings will be required. Following the initial review of the documents, the EC will be asked to approve the Resolution establishing the BOD for the Centenary fund.

During the discussion of the Establishment of an Endowment mechanism, the Treasurer and Vice President noted that a new narrative be created to communicate to an external audience the unique value proposition of IUPAC relative to many other organizations.

#### 6.4 NAO'S APPROACHING 12 MONTHS AND 24 MONTHS IN ARREARS

The NAOs approaching 12 months in arrears (Due 31 December 2019) are Bangladesh, Belgium, Puerto Rico and Sri Lanka. Mozambique is approaching 24 months in arrears and notified IUPAC that they no longer can pay to belong to IUPAC. They are in arrears for \$2,000 and will be automatically withdrawn as an IUPAC NAO due to non-payment.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

The total outstanding balance (AR) is \$70,458 which includes the last of three payments from China/Beijing (\$43,266). A summary report is included in the Agenda book for 2019 and 2020 NAO payments. 2020 payments received thus far are \$59,677 and are not included in the 2019 income.

#### 6.5 BUDGET UPDATE FOR 2020-2021

The position is unchanged from the GA (July). A priority is to pay down the line credit of \$350k so as to avoid ongoing interest charges. It is to help balance the cash flow across the year for operations not as permanent borrowing.

### 7. PUBLICATIONS

MR. HUMPHRIS/DR. SOBY

#### 7.1 DE GRUYTER CONTRACT STATUS

We have agreed to extend the current contracts by one year by way of a side letter that is awaited. The DG team has undergone significant change and they are in the process of introducing a completely new publishing platform. We would like experience of both before renegotiating.

#### 7.2 STATUS REPORT *CHEMISTRY INTERNATIONAL AND CI DIGITAL UPDATE*

The Editorial Board is transitioning with some original members standing down (Leiv Sydnes and David Martinson). Bonnie Lawlor has agreed to continue as Secretary and Colin Humphris as Chair for the next Biennium.

During the most recent board meeting we discussed at length the future of CI and the transition to a digital format. A significant constraint is the current need to publish in both print and digital form. Print numbers are now very low but the board was also concerned by the low numbers accessing the digital version through the IUPAC website and reported problems with the alert systems. These are being addressed offline.

The Board would be interested in the view of EC members for the future. CI or something like it is important to keeping our members and volunteers up to date with IUPAC activities and issues and provides a public window of chemistry issues and IUPAC views on these. It is unlikely to be a revenue earner but is included in the bundling with PAC and the PAC database to libraries and other customers. Small volumes of print are relatively expensive.

#### 7.3 STATUS REPORT *PURE AND APPLIED CHEMISTRY*

The EC was asked to note that 2020 is the 60<sup>th</sup> Anniversary of PAC. A unique PAC Cover will be used to differentiate this anniversary year.

#### 7.4 STATUS REPORT *CHEMISTRY TEACHER INTERNATIONAL*

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

A status report of CTI was included in the Agenda book for reference.

#### 7.5 VIRTUAL PUBLISHING AND DATABASES

##### 7.5.1 IUPAC Standards On Line with DeGruyter

##### 7.5.2 Opportunities with American Institute of Physics (AIP) for Solubility Data Series

The work with AIP is continuing with a small working group from both IUPAC and AIP, led by Ms. Bonnie Lawlor. The group meets regularly with an objective to determine if there is a commercially viable product for the SDS. The market research firm Hannover Research is currently conducting a survey to determine the value proposition and gather input for the team to determine whether a commercially viable product (CVP) is feasible. A draft of the survey instrument was included in the Agenda book for information. The target deadline is being extended until end of 2020, when a go/no go decision will be made. It was important to remind the EC that the agreement with AIP includes an option for IUPAC to regain ownership of the SDS rights from AIP, should there be a “no-go” decision on the CVP.

#### 7.6 PAC EDITORIAL ADVISORY BOARD

**PROF. HARTSHORN**

The draft minutes for the July meeting of the PAC EAB are attached for information.

The roster for the 2020-2021 biennium is attached for information.

#### 7.7 BOOK PUBLICATIONS

**DR. SOBY**

Dr. Soby stated that there are currently a number of book projects and manuscripts in process. The launch of the Gold Book is currently on-line but significant work is still to be done on the inputs from the Divisions. The Orange Book (RSC) is behind schedule and is in ICTNS review. The 4<sup>th</sup> Volume of Janos Fischer's book, Developments in Drug Discovery is in progress, with all royalties to IUPAC. The Green Book and Blue Book are also in progress for future publication with RSC. Springer contract is completed for Mammino's Biomass book, in progress.

#### 8. STATUS OF COMPANY ASSOCIATES PROGRAM

**MR. HUMPHRIS**

The number of paid CA's in 2018 was 32 and the 2019 CAs was 33. The 2020 pricing of Heritage members via a CA Coordinator is \$2,000 of which IUPAC receive \$1,000. New CAs pay \$2,500 where IUPAC receives \$2,500. The 2020 pricing for IUPAC direct is \$1,500 for Heritage members and \$2,500 for new CAs. Thus, if numbers are same in 2020, IUPAC should receive increased income over 2019. The CA renewals are currently in process and usually “trickle in” during first quarter.

#### 9. STATUS OF AFFILIATE MEMBERSHIP PROGRAM

**MR. HUMPHRIS**

##### 9.1 AFFILIATE MEMBERSHIP PROGRAM (PAID AMPs)

## 158th MEETING OF EXECUTIVE COMMITTEE

## APPROVED MINUTES

Mr. Humphris reported on the status of the 2019 Affiliate Membership Program. The 2019 AMPs paid at \$50.00 and included a digital access to Chemistry International. Those who wanted a print copy paid a fee of \$25.00 for CI. For the year, there were 68 print copies ordered by our Affiliate members.

CI 2019 Issue 41	Paid CI Print	Digital AMP_Total	Sponsored Digital AMP_Subtotal
41_1	14	854	-
41_2	47	726	264
41_3	63	766	272
41_4	68	883	357

The 2020 AMP renewals began September 2019 for 2020. The AMP numbers are up over the 2018 during the same timeframe. The Sponsored Affiliate Membership program was put on hold (under review) given concerns regarding management and administrative effort required (costs).

## 9.2 NATIONAL AFFILIATE PROPOSAL (REPLACEMENT OF SPONSORED AMP)

In Sao Paulo, Council agreed changes to both the AMP and the CA schemes that would allow participation in IUPAC by members from non-NAO countries. The Secretariat is already working with a number of non-member countries to encourage them to set up local AMP and CA programs as routes to engaging them in our work. If they coordinate these programs, they can earn a proportion of the subscription income. It also creates the opportunity for them to nominate chemists to non-supported (Associate Member) positions on our Divisions and Committees. The Financial Options Paper presented to Paris Council raised the possibility of national members who pay no annual subscription and have no Council votes but who become associated with IUPAC providing some access to their chemists to IUPAC. The paper was accepted by Council. We might formalize the current position and call them, provisionally, Associate National Organizations ANO. Such a route could broaden membership significantly and make IUPAC more truly international. It would also allow us to abandon the largely unsuccessful ANAO approach. We have just one, Kenya, and they will shortly have to opt for full NAO membership.

**1. The first proposal to the Executive Committee is that we adopt the category Associate National Organisations provisionally until Montreal Council at which we could adopt it and replace ANAO membership. In the meantime we can formalise the benefits to countries as a marketing tool based on the current informal practice to encourage further interest in IUPAC in the organizations/group/universities who actively coordinate an IUPAC Affiliate Member program and/or the IUPAC Company Associate Program and local chemists.**

- The EC approved the recommendation to adopt a new category “Associate National Organizations” and continue promoting the benefits of coordinating the IUPAC Affiliate Member program and the IUPAC Company Associate Program.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

It should be recalled that Mr. Humphris raised the question of the costs of AMP membership to chemists in developing countries at Council where the AMP subscription may be significantly greater than that for their national chemistry society. We have for some years offered Sponsored AMP membership to chemists in developing countries. This free membership has led to anomalies where we have paying members and sponsored members in the same country. There is no evidence that this category leads to any real engagement and it is particularly troublesome for the Secretariat to administer. The definition of developing countries is itself fraught with difficulty and is not used by the UN any more. The World Bank income categories (GNP per capital) would be more helpful especially in identifying the High Income Countries

[https://en.wikipedia.org/wiki/World\\_Bank\\_high-income\\_economy](https://en.wikipedia.org/wiki/World_Bank_high-income_economy) .

Our recommendation is that we simplify matters by:

- closing the Sponsored AMP scheme for 2020 onwards
  - charging the current AMP fee through the current NAOs coordinating the scheme.
  - For the recognised emerging economies Brazil, Russia, India, China and South Africa (BRICS) we should undertake a review of subscription rates with the adhering organisation (or former adhering organisation Brazil) as a basis for recommending change at the Montreal Council.
  - For the provisional Associate National Organisations we would offer the scheme through a national coordinator at a discounted rate \$15 per annum for countries except those in the World Bank high income category. The fee would be shared 50/50 with IUPAC. In High Income Countries the full current subscription fee would apply. The objectives would be to provide some benefit/incentive to the coordinating organisation and more meaningful engagement from AMPs in these countries. People are more likely to value something they make some payment for.
  - Applications for AMP membership direct to the IUPAC would continue to be at the current rate. Chemists from lower income countries would be encouraged to work through the national coordinating organisations. Nationality would be defined by country of primary residence and work. Where potential members live/work in more than one country the highest income country would define the subscription rate.
2. **Secondly we recommend that the sponsored AMP category is terminated for 2020 onwards and that we offer a discounted membership (\$15) annual rate to chemists in lower income Associate National Organisation countries. We should confirm the recent email exchanges in relation to this recommendation.**
- The EC approved the recommendation to formally terminate the Sponsored Affiliate Member program for 2020 onwards. A discounted membership of \$15.00 should be offered to lower income Associate National Organization countries.
3. **Thirdly we recommend that we undertake a subscription review in the BRICS countries to make recommendation to Montreal Council on differentiated AMP subscriptions if appropriate.**

The Treasurer and Executive Director will continue working the ANO details in order to propose to Council a replacement of the ANAO program after detailed review of the ability to pay in BRICS countries.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

#### **10. IUPAC 100 - CENTENARY PLANNING STEERING GROUP      PROF. GARSON/DR. MCCONNELL**

Prof. Garson and Dr. McConnell joined the EC meeting to provide updates on IUPAC100 activities. They reviewed the Periodic Table of Younger Chemists, the Global Women's Breakfast (GWB) and the Periodic Table Challenge. They noted that the Global Women's Breakfast would continue in 2020 and work is currently in progress to develop the website, theme and date. The GWB2020 will actively seek sponsorships and develop a longer-term project proposal for continuation of the GWB.

#### **11. INTERNATIONAL YEAR OF THE PERIODIC TABLE      PROF. TARASOVA/PROF. BRETT**

##### 11.1 FINANCIAL REVIEW

An overview of the finances of IYPT, as of 1 December 2019, was presented by Prof. Tarasova. According to the MC's communication, funds left over will be distributed back on a percentage basis to the sponsors. The Project funds most likely will be fully spent by end of April 2020 (Covers KNCV admin until April for transfer of website and the development of the final report)

##### 11.2 REVIEW AND NEXT STEPS (E.G. WEBSITE ARCHIVING)

Dr. Soby discussed the IYPT2019 website, currently held by KNCV, and the transition to IUPAC in 2020. The website will maintain the current "URL" for archival purposes and will be updated when the final report is completed later in 2020.

#### **12. INTERNATIONAL YEAR OF THE BASIC SCIENCES FOR DEVELOPMENT 2022      PROF. BRETT**

Prof. Brett discussed the IYBSD and possible MOU with IUPAP for partnership. The draft document is included in the Agenda book for review.

#### **13. DIVISION EMERITUS FELLOWS AND OTHER RECOGNITION MECHANISMS**

**PROF. HARTSHORN**

Prof. Hartshorn discussed the Emeritus fellow program. The EC was asked to approve a proposal to extend Division Emeritus Fellows (currently approved by Council for Divisions I, VII, and VIII) to other IUPAC Divisions to harmonize the program across all Divisions. The EC discussed the Emeritus fellow extension of Division and questions regarding the extension to Standing Committees ensued. This initial outreach of this was directed to only the divisions.

- The EC approved the proposal to extend Division Emeritus Fellows to other IUPAC Divisions in order to harmonize the program.

He proposed the question of whether there should be a working group to examine the more general issue of recognizing service to IUPAC? The discussion regarding this ensued regarding the possible overlap with the Review Group's work, timing of possible recommendations.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

Recognition of volunteers and their service is important however it may be part of the review group's recognition and it was decided to put a hold on a working group to examine this. Richard will reach out to the Division Presidents and Standing Committee Chairs to develop a recognition plan for outstanding members of their organizations.

#### **14. ROSTERS FOR DIVISIONS AND STANDING COMMITTEES** **PROF. HARTSHORN/PROF BRETT**

Rosters for the Division and Standing Committees were presented to the EC for the approval of those whose compositions were delegated to the Executive Committee for ratification. Prof. Tarasova noted that the National Representative for Russia on CCE should be updated to Dr. Denis Zhilin. Notification was sent via email on 13 December 2019 after the Roster was prepared. The EC approved this change as requested by the National Committee of Russian Chemists.

- The EC approved the requested exceptions to the Divisions and Standing Committee
- The EC approved the Division Committee Rosters that were delegated to the EC for exceptional circumstances.

#### **15. ROSTERS FOR BUREAU COMMITTEES FOR 2020-2021** **PROF. ZHOU**

Status on membership of Bureau committees was presented by Prof. Zhou. The proposed membership was in the Agenda book for reference.

#### **16. REPRESENTATIVES "ON" ORGANIZATIONS** **PROF. ZHOU/PROF. HARTSHORN**

A listing of volunteers and staff members to serve as IUPAC representatives on organizations whose work complements IUPAC's activities was presented to the Executive Committee for approval.

- The EC approved the proposed IUPAC Representatives "ON" other organizations for both the IUPAC and Division representatives.

#### **17. 2019 GA/CONGRESS, PARIS, FRANCE** **DR. SOBY /PROF. HARTSHORN**

##### **17.1 FEEDBACK ON ELECTION PROCESS AND GA SCHEDULE**

Dr. Soby discussed the feedback received on the election process was primarily focused on communication and engagements between the Secretariat/Officers and articulating responsibilities of the Division Presidents (involvement in the process), the Nominating Chairs, the development of TM ballots as well as clarity on eligibilities. (S&B)

Timelines were followed by the NAOs for their nominations. However, once received the internal mechanisms and timing/deadlines were problematic and delays occurred.

The GA Schedule feedback will be incorporated into the Montreal 2021 GA with the early ICTNS meeting (well received, but expensive). Room conditions, breaks, and other complaints are being addressed with the Canadian organizers.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

#### 17.2 WCLM

**PROF. OBER**

Following a review of the Paris WCLM activity, Prof. Ober, Prof. Hartshorn, Dr. Meyers and Dr. Soby met to draft a proposal for the WCLM in Montreal. This will be discussed in 18.3. YOs and RYOs engagement

One major issue of the Young Observer/RYO engagement was the registration system (for all registrants). The other major issue was not having a clear, articulated program/brochure that outlines what a Young Observer is able to participate in, etc.

#### 18. 2021 GENERAL ASSEMBLY & CONGRESS, MONTREAL, CANADA

**DR. SOBY**

##### 18.1 SITE VISIT REPORT

Dr. Soby updated the EC on the Montreal site visit in October 2019.

##### 18.2 GA SCHEDULE

The GA 2021 schedule will mostly mirror the Paris schedule with the following changes:

- There will be an Awards Ceremony for ALL awards (Congress and GA and CSIC) including Poster prizes from the Congress. Thus, the IUPAC-Solvay Awards, IUPAC-NHU Awards, Division VII Poster Prizes among others will be presented. This ceremony will be open to all and followed by a dinner reception.
- This could potentially impact attendance of the Award winners (above) but we have ample time to plan for this.

##### 18.3 WCLM 2021

Key highlights of the plan for 2021 are as follows:

- The WCLM should be an Executive Committee responsibility with high level of engagement.
- The focus of the WCLM should revolve around the SDG's and a theme of Chemistry for Society.
- The Purpose of the WCLM: Engagement of CEO's (Board Level) from global Chemical companies (perhaps related industries) to discuss the role that THEY see IUPAC can play in furthering the relationship with society as well as addressing the issues they see as priorities.
- Building and maintaining relationships between IUPAC and Industry is a key outcome of the WCLM.
- Pre-WCLM meeting: time and place to meet before the WCLM
  - Breakfast with IUPAC Executives and leaders with CEOs.
  - Engagement of a speaker for the kick-off.
- WCLM Session:
  - Panel discussion with key CEOs and IUPAC representatives

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

- Discussion moderated with prepared topics and questions agreed upon by both IUPAC and CEOs.
- Include audience to pose questions to the panel for a dialogue

The Executive Committee was asked to discuss the proposal and provide input.

#### 18.4 APPLICATION FOR ENDORSEMENT AND SYMPOSIA

The application for the Montreal 2021 is in the agenda book and a list of symposia provided for inputs and review. The Application will be forwarded to the Bureau following the EC meeting. No comments were made.

#### 18.5 SPONSORSHIP/FUNDRAISING

### 19. IYCN DEVELOPMENTS

**DR. SOBY**

Dr. Soby discussed the work of IYCN stating that they are now actively engaged with IUPAC in the following:

- IUPAC is providing a separate bank account under the IUPAC accounts in order for IYCN to manage their funds and sponsorships.
- IUPAC has set up a Stripe account for IYCN to provide invoices for incoming funds. IUPAC reconciles this account on a monthly basis and advises on bank balances.
- IYCN falls under the IUPAC accounts and thus the US Audit and tax filing.
- Consultation on a number of IYCN issues is ongoing as needed.

### 20. STATUS REPORT ON IUPAC SECRETARIAT

**DR. SOBY**

Dr. Soby updated the EC on a variety of issues, including the website status, social media and its implementation during 2019 for IUPAC100. She updated the list of website editors and staff responsibilities.

A succession plan was presented which included a plan to replace Ms. Linda Tapp upon her retirement.

### 21. CIAAW PRESS RELEASE FOR EC APPROVAL

**PROF. HARTSHORN**

A draft press release from CIAAW was in the Agenda book. EC was asked to approve the release.

- The EC approved the CIAAW Press Release

### 22. IUPAC COMMITTEE FOR ISC

**PROF. TARASOVA/PROF. ZHOU**

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

#### 22.1 UPDATE ON ICSU GRANT: "A GLOBAL APPROACH TO THE GENDER GAP IN MATHEMATICAL AND NATURAL SCIENCES: HOW TO MEASURE IT, HOW TO REDUCE IT?"

**PROF. CHIU**

#### 22.2 UPDATE ON ISC: ISC ACTION PLAN FOR 2019-2021

Prof. Tarasova updated the EC on the activities of ISC in the year 2019. ISD Annual report may be found at <https://council.science/annualreport2018>. The ISC action plan may be found at <https://council.science/actionplan>

#### 22.3 ISC: VALUE PROPOSITION FOR IUPAC

### 23. MEMBERSHIP RELATIONS COMMITTEE

**PROF. TARASOVA**

Prof. Tarasova reported on the activities undertaken by the IUPAC MRC in the year 2019.

### 24. PROJECTS IN REVIEW

**DR. SOBY**

#### 22.1 PROPOSALS IN REVIEW

The deadline for submission of new projects from the 2018-2019 budgets has ended. There are currently 11 proposals in review with financial commitment of \$90,750.

#### 22.2 PROJECT AND FINANCIAL REPORT

**DR. SOBY**

The 31 October project and financial report was discussed. Dr. Soby noted the current remaining balance of the current projects (page 27) is \$656,821.

The Executive Committee was asked to approve the removal of project #2015-007-1-020 ICSU from the project report. This project was never started and should be removed from the report at this time.

- The EC Approved removing this project from the EC list of projects.
- The EC is asked to appoint a project manager for all projects contained within the EC as a matter of oversight of the EC strategic projects.

### 25. EVALUATION COMMITTEE UPDATE

**PROF. BRETT**

### 26. IUPAC-IUPAP COOPERATION

**PROF. TARASOVA**

Prof. Tarasova informed the EC of the status of the IUPAC-IUPAP relationship. She discussed the proposed MoU terms regarding collaboration and interaction with IUPAP.

- The EC discussed the terms of the MoU and plans forward towards formalizing the MoU
- Natalia will communicate with IUPAP regarding the input questions
- Lars Ohrstom will be the key negotiator with Richard Hartshorn to formalize the MoU

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

#### 27. THE PHOSAGRO PROJECT

**PROF. BRETT**

Chris is now on the Jury of the project. Signing of the project was late at UNESCO therefore publications were also delayed. Jury met in September and decisions made in November. Publicity is very good for this program.

#### 28. INChI TRUST

**PROF. HARTSHORN**

A report on the InChI Trust and its activities was provided to the EC for information. The essence of the report is that IUPAC has a fundamental role in InChI Trust and is tied to Division VIII and CPCDS. Richard discussed that there were some issues in communications between both organizations, but work is in process for improving the situation.

#### 29. OPCW

**PROF. HARTSHORN**

A broader interaction with OPCW is being developed. Analytical, Environmental, Education, and Nomenclature collaborations are developing using groups that were assembled following the impromptu meeting at the General Assembly. These are being led by: Zoltan Mester, Hemda Garelick, Jan Apotheker, and Ed Constable, respectively. These groups will work to build separate liaisons with different parts of OPCW. Increased overlap with OPCW people is the objective, given past difficulties in maintaining collaborations due to turnover in both organizations. Chris Brett discussed his meeting and connections during his visit to OPCW and challenges in OPCW. He mentioned his conversation with OPCW Secretary General regarding what OPCW sees for IUPAC and how we can assist better. One area of interest is the education of Science Diplomats in chemistry-related issues.

Christopher Brett will attend OPCW and will give a speech on an annual basis (as President of IUPAC). Next year's meeting will be put into his calendar. This tradition should be continued for all IUPAC Presidents to continue the relationship with OPCW

#### 30. CONFERENCE ENDORSEMENT/SPONSORSHIP PROGRAM

**DR. SOBY**

##### 30.1 RATIFICATION OF ENDORSEMENT/SUPPORTED SYMPOSIA

For the time period of October 2018 to November 2019, there were 4 supported conferences and 27 IUPAC Endorsed conferences approved.

- The EC ratified the conference endorsements as of 30 November 2019.

#### 31. ACTION ITEMS FROM PREVIOUS MEETINGS

**PROF. HARTSHORN**

The cumulative action items from previous meetings were discussed. The Gender Gap project with Mei-Hung action item should be put on hold.

#### 32. NEXT BUREAU MEETING

**DR. SOBY/PROF. ZHOU**

#### 33. DATES AND PLACE OF 2020 EXECUTIVE COMMITTEE MEETING

**PROF. ZHOU**

158th MEETING OF EXECUTIVE COMMITTEE

APPROVED MINUTES

**34. ANY OTHER BUSINESS**

**ALL**

**18:00 ADJOURN**

# International Union of Pure and Applied Chemistry

158<sup>th</sup> MEETING OF THE EXECUTIVE COMMITTEE

Tokyo, Japan 06 December 2019

## DECISIONS AND ACTIONS

Decisions and Actions from the 158<sup>th</sup> Executive Committee and relevant Agenda Items are listed below.

### 158<sup>th</sup> Executive Tokyo 2019

[158EC2] Minutes of the 157<sup>th</sup> Executive Committee were noted as previously approved.

[158EC3] Draft minutes of the 103<sup>rd</sup> Bureau minutes were received and approved to seek Bureau approval.

[158EC4] The EC approved the membership of the Organization Review group proposed membership list. The EC also confirmed that Prof. Brett continue as the liaison to the group.

[158EC5] During the discussion of the Establishment of an Endowment mechanism, the Treasurer and Vice President noted that a new narrative be created to communicate to an external audience the unique value proposition of IUPAC relative to many other organizations. *[No Person Assigned]*

[158EC6] The Treasurer and Executive Director will develop a formal Travel and Expense policy and present to Bureau at the 2020 meeting for approval. *[CH/LMS]*

[158EC9.1] The EC approved the recommendation to adopt a new category “Associate National Organizations” and continue promoting the benefits of coordinating the IUPAC Affiliate Member program and the IUPAC Company Associate Program.

[158EC9.2] The EC approved the recommendation to formally terminate the Sponsored Affiliate Member program for 2020 onwards. A discounted membership of \$15.00 should be offered to lower income Associate National Organization countries.

[158EC9.3] The Treasurer and Executive Director will continue working the ANO details in order to propose to Council a replacement of the ANAO program after detailed review of the ability to pay in BRICS countries. *[CH/LMS]*

[158EC13] The EC approved the proposal to extend Division Emeritus Fellows to other IUPAC Divisions in order to harmonize the program.

[158EC14] The EC approved the Division Committee Rosters that were delegated to the EC for exceptional circumstances.

[158 EC16] The EC approved the proposed IUPAC Representatives “ON” other organizations for both the IUPAC and Division representatives.

# **International Union of Pure and Applied Chemistry**

158<sup>th</sup> MEETING OF THE EXECUTIVE COMMITTEE

Tokyo, Japan 06 December 2019

## **DECISIONS AND ACTIONS**

[158EC21] The EC approved the CIAAW Press Release.

[158EC20] The EC ratified the conference endorsements as of 31 November 2019.

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# International Union of Pure and Applied Chemistry

## 158<sup>th</sup> MEETING OF EXECUTIVE COMMITTEE

Tokyo, Japan, December 6, 2019

### APPROVED MINUTES

#### 1. INTRODUCTORY REMARKS AND FINALIZATION OF AGENDA

Attendees: Prof. Qi-Feng Zhou (Chair), Prof. Christopher Brett, Prof. Natalia Tarasova, Prof. Richard Hartshorn, Mr. Colin Humphris, Dr. Lynn Soby, Prof. Mei-Hung Chiu, Prof. Christopher K. Ober

Guest: Ms. Minjie Huang

Secretary: Dr. Lynn Soby (Executive Director)

Prof. Qi-Feng Zhou welcomed all participants and members of the Executive Committee (EC) and thanked the Chemical Society of Japan for hosting the meeting for the arrangements and support for IUPAC.

Prof. Zhou then asked Prof. Hartshorn to chair the meeting. No additional items were added to the Agenda.

#### 2. MINUTES OF 157<sup>TH</sup> (MADRID, 17-18 NOV 2018) MEETING OF EXECUTIVE COMMITTEE

Minutes of the 157<sup>th</sup> Executive Committee were noted as previously approved.

#### 3. MINUTES OF 103<sup>RD</sup> MEETING OF THE BUREAU (PARIS, 9 AND 12 JULY 2019)

##### 3.1 RECEIPT OF MINUTES BY EC

Draft minutes of the 103<sup>rd</sup> Bureau minutes were received by the EC and approved to seek Bureau approval.

#### 4. PROGRESS ON ESTABLISHMENT OF THE REVIEW GROUP

At the 50th General Assembly of IUPAC in Paris, Council approved a motion for the Executive Committee to establish a working group by the 1st January 2020 to undertake a complete review of the organizational structure of IUPAC.

On 19 July, Our Treasurer Mr. Colin Humphris provided a draft letter to go to the NAOs as a first step in ensuring their full engagement in the review, and a new draft was made by Secretary General Prof. Richard Hartshorn based on that from Colin and the comments from EC members. This letter followed by a questionnaire will be sent to NAOs for their input and fully active engagement.

On 3 September, Richard restarted the conversations around the structure and establishment of the review group. A quick response was first made by Colin who offered his initial suggestions that formed a good base for further discussions by all EC members.

Prof. Brett, working with Dr. Cesa proposed the membership of the Review Group for EC decision. The suggested membership was a combination of “internal” and “external” members, and diversity was taken in consideration. The EC also confirmed that Prof. Brett continue as the liaison to the group.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

- Mark Cesa, Chair (USA)
- Javier Garcia-Martinez (Spain) Vice President IUPAC
- Ito Chao (China/Taipei)
- Michael Droeschler (Germany)
- Lori Ferrins (IYCN) (Australia)
- Zhi-Gang Shuai (China/Beijing)

#### 5. STRATEGIC ISSUES FOR THE NEXT BIENNIUM

**PROF. BRETT**

Prof. Brett outlined his view of how the IUPAC strategy should develop over the next biennium. Appropriate measures need to be taken so that the results of the important IYPT events of the last year, which have captured the enthusiasm of the chemical and scientific community and the public at large, are not lost. We also need to increase the effectiveness of collaboration both inside and outside IUPAC.

Inside IUPAC we need to find ways to increase information exchange. All of us from officers through to task groups need to be tuned to work together and not duplicate efforts and use resources efficiently. We must devise ways, early on in the biennium, to minimize the impact of not having face-to-face meetings in the divisions and standing committees, the executive committee and in bureau, using this as an opportunity to streamline our operations.

Outside IUPAC, we need to increase our visibility worldwide. In IUPAC conferences, the interventions of the IUPAC representative have not always had sufficient impact. We should all explore all the opportunities that arise for dissemination, particularly focusing on those that represent how we can respond to challenges to chemistry and collaborate in responding to them, demonstrating our crucial role. We should all be communicating the same IUPAC message, and be reaching out to those parts of the world where the impact of IUPAC is less clear. For this purpose, a fully up-to-date speaker pack and accessory information is very important. We need to have a strong voice, as has happened with UNESCO and OPCW, and make our mark in all relevant international organizations in a way that is pertinent and useful to the scientific community and society.

To consolidate the legacy of IYPT and the centenary, we need to continue with worldwide activities, such as the global breakfast, which will take place in 2020. He suggested action items include enhancing communications and updating the IUPAC Presentation, update contacts with external organizations and engagement with their programs, particularly ISC.

#### 6. FINANCE AND BUDGETS

**MR. HUMPHRIS/DR. SOBY**

##### 6.1 REPORT ON CURRENT FINANCIAL SITUATION (CF 2018-2019 BUDGET)

Colin Humphris referred to the financial items in the Detailed Agenda and Agenda Book for details. *All financial information presented at the EC meeting and contained in the Agenda and documents were pre-Audit and is subject to change.*

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

The approved minutes from the 2019 Finance Committee (FC) are included for reference to the Financial items. The Income Statement and Balance sheet as of 30 October 2019 are included in the Agenda book. IUPAC continued reporting on a full accrual basis which continues to provide great insight into the financial performance of the Union and importantly its cash needs.

Mr. Humphris stressed the need for the Executive Committee members to review and gain an understanding of the P&L, as they provide a comprehensive review of the financial health and outlook for IUPAC.

In 2018 we recorded a loss of \$368k in the Profit and Loss account that included an unrealized loss on the investment portfolio of \$210k. To end October 2019, we show a profit of \$304k but this includes an unrealized gain of \$522k so we are in deficit at the operating level i.e. excluding unrealized gains and losses. To the end of the year we will expect to see publication income close to plan with the end year payment from DeGruyter but otherwise the bulk of invoiced income is already shown. We have two months of operating costs to record including inevitably some late claims for the GA.

The bottom line was that in this biennium we will be close to breakeven or showing a small deficit the reason for us taking action within the budget for 2020 and 2021.

The Executive was asked to note the Main Messages looking at the P&L as of 30 October:

- NAO income was below plan following the loss of Brazil and Pakistan offsetting the gain of Singapore
- Growth in income from CA's and AMP's still lag behind our budgetary hopes
- Our Secretariat and Administrative costs are in budget overall
- Our Travel and Subsistence expenditure was well below budget
- Balance sheet shows cash available was \$96,472 (after exclusion of cash sweeps within the investment portfolio) in comparison with Accounts Payable of \$42,365.
- Accounts receivables from primarily NAOs was much healthier than in 2018 with \$115,136 owing.
- EC members should note that the website and database projects have moved from Work in Progress (WIP) to implementation and depreciation.
- The short-term notes payable was our line of credit that was fully utilized at \$350k. In September, the Finance Committee approved the extension of the line of Credit to \$500k given persistent cash flow issues through the year but have avoided extending our borrowing beyond \$350k. A full cash flow report was included in the Agenda book for reference.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

#### 6.1.1 Overview of GA and IUPAC100

The 2019 GA Budget Expectation was that Paris would be more expensive than Sao Paulo for travel and subsistence. From the P&L, it was noted that the travel and subsistence was below budget expectations. Anticipated extra expenses were for IUPAC100 (50k), Council Room/Food (40k), WCLM (21k). While some items were still being reconciled to actual expenses over the year, it was anticipated to remain under budget for the GA and IUPAC100 Activities (not covered within projects).

#### 6.2 PERFORMANCE OF INVESTMENT PORTFOLIO

The balance sheet also showed the recovery of the value of investment portfolio to the value in October 2018. The Finance Committee remains satisfied with the performance of our advisors BB&T and reconfirmed our investment criteria at the meeting in September 2019.

#### 6.3 ESTABLISHMENT OF ENDOWMENT MECHANISM

The Council (Paris, 2019) approved the future appointment of the Centenary Endowment Fund Board of Directors including external Directors by the Executive Committee. Council also approved the Executive Committee to progress in the formation of the fund and its guiding documents. The law firm of Manning and Fulton were contacted to develop an Endowment Agreement and Guidelines necessary for the creation of the Endowment Fund. Additional papers for donations are also being crafted. We are working through the initial drafts of the documents. The IUPAC investment firm, BB&T/Scott & Stringfellow, provided their perspective to the Finance Committee on the membership of the external members, stating that the BOD will need “star power” Nobel Laureate-type reputation, a C-level individual from a major Chemical company and another with legal background.

The Treasurer and Executive Director are currently reviewing the initial documents from our legal firm, which include a resolution that will require approval of the Executive Committee. This resolution outlines how the BOD will function. The intention is that the BOD members serve as volunteers for IUPAC and not require funds to participate. Regular meetings will be required. Following the initial review of the documents, the EC will be asked to approve the Resolution establishing the BOD for the Centenary fund.

During the discussion of the Establishment of an Endowment mechanism, the Treasurer and Vice President noted that a new narrative be created to communicate to an external audience the unique value proposition of IUPAC relative to many other organizations.

#### 6.4 NAO'S APPROACHING 12 MONTHS AND 24 MONTHS IN ARREARS

The NAOs approaching 12 months in arrears (Due 31 December 2019) are Bangladesh, Belgium, Puerto Rico and Sri Lanka. Mozambique is approaching 24 months in arrears and notified IUPAC that they no longer can pay to belong to IUPAC. They are in arrears for \$2,000 and will be automatically withdrawn as an IUPAC NAO due to non-payment.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

The total outstanding balance (AR) is \$70,458 which includes the last of three payments from China/Beijing (\$43,266). A summary report is included in the Agenda book for 2019 and 2020 NAO payments. 2020 payments received thus far are \$59,677 and are not included in the 2019 income.

#### 6.5 BUDGET UPDATE FOR 2020-2021

The position is unchanged from the GA (July). A priority is to pay down the line credit of \$350k so as to avoid ongoing interest charges. It is to help balance the cash flow across the year for operations not as permanent borrowing.

### 7. PUBLICATIONS

MR. HUMPHRIS/DR. SOBY

#### 7.1 DE GRUYTER CONTRACT STATUS

We have agreed to extend the current contracts by one year by way of a side letter that is awaited. The DG team has undergone significant change and they are in the process of introducing a completely new publishing platform. We would like experience of both before renegotiating.

#### 7.2 STATUS REPORT *CHEMISTRY INTERNATIONAL AND CI DIGITAL UPDATE*

The Editorial Board is transitioning with some original members standing down (Leiv Sydnes and David Martinson). Bonnie Lawlor has agreed to continue as Secretary and Colin Humphris as Chair for the next Biennium.

During the most recent board meeting we discussed at length the future of CI and the transition to a digital format. A significant constraint is the current need to publish in both print and digital form. Print numbers are now very low but the board was also concerned by the low numbers accessing the digital version through the IUPAC website and reported problems with the alert systems. These are being addressed offline.

The Board would be interested in the view of EC members for the future. CI or something like it is important to keeping our members and volunteers up to date with IUPAC activities and issues and provides a public window of chemistry issues and IUPAC views on these. It is unlikely to be a revenue earner but is included in the bundling with PAC and the PAC database to libraries and other customers. Small volumes of print are relatively expensive.

#### 7.3 STATUS REPORT *PURE AND APPLIED CHEMISTRY*

The EC was asked to note that 2020 is the 60<sup>th</sup> Anniversary of PAC. A unique PAC Cover will be used to differentiate this anniversary year.

#### 7.4 STATUS REPORT *CHEMISTRY TEACHER INTERNATIONAL*

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

A status report of CTI was included in the Agenda book for reference.

#### 7.5 VIRTUAL PUBLISHING AND DATABASES

##### 7.5.1 IUPAC Standards On Line with DeGruyter

##### 7.5.2 Opportunities with American Institute of Physics (AIP) for Solubility Data Series

The work with AIP is continuing with a small working group from both IUPAC and AIP, led by Ms. Bonnie Lawlor. The group meets regularly with an objective to determine if there is a commercially viable product for the SDS. The market research firm Hannover Research is currently conducting a survey to determine the value proposition and gather input for the team to determine whether a commercially viable product (CVP) is feasible. A draft of the survey instrument was included in the Agenda book for information. The target deadline is being extended until end of 2020, when a go/no go decision will be made. It was important to remind the EC that the agreement with AIP includes an option for IUPAC to regain ownership of the SDS rights from AIP, should there be a “no-go” decision on the CVP.

#### 7.6 PAC EDITORIAL ADVISORY BOARD

**PROF. HARTSHORN**

The draft minutes for the July meeting of the PAC EAB are attached for information.

The roster for the 2020-2021 biennium is attached for information.

#### 7.7 BOOK PUBLICATIONS

**DR. SOBY**

Dr. Soby stated that there are currently a number of book projects and manuscripts in process. The launch of the Gold Book is currently on-line but significant work is still to be done on the inputs from the Divisions. The Orange Book (RSC) is behind schedule and is in ICTNS review. The 4<sup>th</sup> Volume of Janos Fischer's book, Developments in Drug Discovery is in progress, with all royalties to IUPAC. The Green Book and Blue Book are also in progress for future publication with RSC. Springer contract is completed for Mammino's Biomass book, in progress.

#### 8. STATUS OF COMPANY ASSOCIATES PROGRAM

**MR. HUMPHRIS**

The number of paid CA's in 2018 was 32 and the 2019 CAs was 33. The 2020 pricing of Heritage members via a CA Coordinator is \$2,000 of which IUPAC receive \$1,000. New CAs pay \$2,500 where IUPAC receives \$2,500. The 2020 pricing for IUPAC direct is \$1,500 for Heritage members and \$2,500 for new CAs. Thus, if numbers are same in 2020, IUPAC should receive increased income over 2019. The CA renewals are currently in process and usually “trickle in” during first quarter.

#### 9. STATUS OF AFFILIATE MEMBERSHIP PROGRAM

**MR. HUMPHRIS**

##### 9.1 AFFILIATE MEMBERSHIP PROGRAM (PAID AMPs)

# 158th MEETING OF EXECUTIVE COMMITTEE

## APPROVED MINUTES

Mr. Humphris reported on the status of the 2019 Affiliate Membership Program. The 2019 AMPs paid at \$50.00 and included a digital access to Chemistry International. Those who wanted a print copy paid a fee of \$25.00 for CI. For the year, there were 68 print copies ordered by our Affiliate members.

CI 2019 Issue 41	Paid CI Print	Digital AMP_Total	Sponsored Digital AMP_Subtotal
41_1	14	854	-
41_2	47	726	264
41_3	63	766	272
41_4	68	883	357

The 2020 AMP renewals began September 2019 for 2020. The AMP numbers are up over the 2018 during the same timeframe. The Sponsored Affiliate Membership program was put on hold (under review) given concerns regarding management and administrative effort required (costs).

### 9.2 NATIONAL AFFILIATE PROPOSAL (REPLACEMENT OF SPONSORED AMP)

In Sao Paulo, Council agreed changes to both the AMP and the CA schemes that would allow participation in IUPAC by members from non-NAO countries. The Secretariat is already working with a number of non-member countries to encourage them to set up local AMP and CA programs as routes to engaging them in our work. If they coordinate these programs, they can earn a proportion of the subscription income. It also creates the opportunity for them to nominate chemists to non-supported (Associate Member) positions on our Divisions and Committees. The Financial Options Paper presented to Paris Council raised the possibility of national members who pay no annual subscription and have no Council votes but who become associated with IUPAC providing some access to their chemists to IUPAC. The paper was accepted by Council. We might formalize the current position and call them, provisionally, Associate National Organizations ANO. Such a route could broaden membership significantly and make IUPAC more truly international. It would also allow us to abandon the largely unsuccessful ANAO approach. We have just one, Kenya, and they will shortly have to opt for full NAO membership.

**1. The first proposal to the Executive Committee is that we adopt the category Associate National Organisations provisionally until Montreal Council at which we could adopt it and replace ANAO membership. In the meantime we can formalise the benefits to countries as a marketing tool based on the current informal practice to encourage further interest in IUPAC in the organizations/group/universities who actively coordinate an IUPAC Affiliate Member program and/or the IUPAC Company Associate Program and local chemists.**

- The EC approved the recommendation to adopt a new category “Associate National Organizations” and continue promoting the benefits of coordinating the IUPAC Affiliate Member program and the IUPAC Company Associate Program.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

It should be recalled that Mr. Humphris raised the question of the costs of AMP membership to chemists in developing countries at Council where the AMP subscription may be significantly greater than that for their national chemistry society. We have for some years offered Sponsored AMP membership to chemists in developing countries. This free membership has led to anomalies where we have paying members and sponsored members in the same country. There is no evidence that this category leads to any real engagement and it is particularly troublesome for the Secretariat to administer. The definition of developing countries is itself fraught with difficulty and is not used by the UN any more. The World Bank income categories (GNP per capital) would be more helpful especially in identifying the High Income Countries

[https://en.wikipedia.org/wiki/World\\_Bank\\_high-income\\_economy](https://en.wikipedia.org/wiki/World_Bank_high-income_economy) .

Our recommendation is that we simplify matters by:

- closing the Sponsored AMP scheme for 2020 onwards
  - charging the current AMP fee through the current NAOs coordinating the scheme.
  - For the recognised emerging economies Brazil, Russia, India, China and South Africa (BRICS) we should undertake a review of subscription rates with the adhering organisation (or former adhering organisation Brazil) as a basis for recommending change at the Montreal Council.
  - For the provisional Associate National Organisations we would offer the scheme through a national coordinator at a discounted rate \$15 per annum for countries except those in the World Bank high income category. The fee would be shared 50/50 with IUPAC. In High Income Countries the full current subscription fee would apply. The objectives would be to provide some benefit/incentive to the coordinating organisation and more meaningful engagement from AMPs in these countries. People are more likely to value something they make some payment for.
  - Applications for AMP membership direct to the IUPAC would continue to be at the current rate. Chemists from lower income countries would be encouraged to work through the national coordinating organisations. Nationality would be defined by country of primary residence and work. Where potential members live/work in more than one country the highest income country would define the subscription rate.
2. **Secondly we recommend that the sponsored AMP category is terminated for 2020 onwards and that we offer a discounted membership (\$15) annual rate to chemists in lower income Associate National Organisation countries. We should confirm the recent email exchanges in relation to this recommendation.**
- The EC approved the recommendation to formally terminate the Sponsored Affiliate Member program for 2020 onwards. A discounted membership of \$15.00 should be offered to lower income Associate National Organization countries.
3. **Thirdly we recommend that we undertake a subscription review in the BRICS countries to make recommendation to Montreal Council on differentiated AMP subscriptions if appropriate.**

The Treasurer and Executive Director will continue working the ANO details in order to propose to Council a replacement of the ANAO program after detailed review of the ability to pay in BRICS countries.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

#### **10. IUPAC 100 - CENTENARY PLANNING STEERING GROUP      PROF. GARSON/DR. MCCONNELL**

Prof. Garson and Dr. McConnell joined the EC meeting to provide updates on IUPAC100 activities. They reviewed the Periodic Table of Younger Chemists, the Global Women's Breakfast (GWB) and the Periodic Table Challenge. They noted that the Global Women's Breakfast would continue in 2020 and work is currently in progress to develop the website, theme and date. The GWB2020 will actively seek sponsorships and develop a longer-term project proposal for continuation of the GWB.

#### **11. INTERNATIONAL YEAR OF THE PERIODIC TABLE      PROF. TARASOVA/PROF. BRETT**

##### 11.1 FINANCIAL REVIEW

An overview of the finances of IYPT, as of 1 December 2019, was presented by Prof. Tarasova. According to the MC's communication, funds left over will be distributed back on a percentage basis to the sponsors. The Project funds most likely will be fully spent by end of April 2020 (Covers KNCV admin until April for transfer of website and the development of the final report)

##### 11.2 REVIEW AND NEXT STEPS (E.G. WEBSITE ARCHIVING)

Dr. Soby discussed the IYPT2019 website, currently held by KNCV, and the transition to IUPAC in 2020. The website will maintain the current "URL" for archival purposes and will be updated when the final report is completed later in 2020.

#### **12. INTERNATIONAL YEAR OF THE BASIC SCIENCES FOR DEVELOPMENT 2022      PROF. BRETT**

Prof. Brett discussed the IYBSD and possible MOU with IUPAP for partnership. The draft document is included in the Agenda book for review.

#### **13. DIVISION EMERITUS FELLOWS AND OTHER RECOGNITION MECHANISMS**

**PROF. HARTSHORN**

Prof. Hartshorn discussed the Emeritus fellow program. The EC was asked to approve a proposal to extend Division Emeritus Fellows (currently approved by Council for Divisions I, VII, and VIII) to other IUPAC Divisions to harmonize the program across all Divisions. The EC discussed the Emeritus fellow extension of Division and questions regarding the extension to Standing Committees ensued. This initial outreach of this was directed to only the divisions.

- The EC approved the proposal to extend Division Emeritus Fellows to other IUPAC Divisions in order to harmonize the program.

He proposed the question of whether there should be a working group to examine the more general issue of recognizing service to IUPAC? The discussion regarding this ensued regarding the possible overlap with the Review Group's work, timing of possible recommendations.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

Recognition of volunteers and their service is important however it may be part of the review group's recognition and it was decided to put a hold on a working group to examine this. Richard will reach out to the Division Presidents and Standing Committee Chairs to develop a recognition plan for outstanding members of their organizations.

#### **14. ROSTERS FOR DIVISIONS AND STANDING COMMITTEES** **PROF. HARTSHORN/PROF BRETT**

Rosters for the Division and Standing Committees were presented to the EC for the approval of those whose compositions were delegated to the Executive Committee for ratification. Prof. Tarasova noted that the National Representative for Russia on CCE should be updated to Dr. Denis Zhilin. Notification was sent via email on 13 December 2019 after the Roster was prepared. The EC approved this change as requested by the National Committee of Russian Chemists.

- The EC approved the requested exceptions to the Divisions and Standing Committee
- The EC approved the Division Committee Rosters that were delegated to the EC for exceptional circumstances.

#### **15. ROSTERS FOR BUREAU COMMITTEES FOR 2020-2021** **PROF. ZHOU**

Status on membership of Bureau committees was presented by Prof. Zhou. The proposed membership was in the Agenda book for reference.

#### **16. REPRESENTATIVES "ON" ORGANIZATIONS** **PROF. ZHOU/PROF. HARTSHORN**

A listing of volunteers and staff members to serve as IUPAC representatives on organizations whose work complements IUPAC's activities was presented to the Executive Committee for approval.

- The EC approved the proposed IUPAC Representatives "ON" other organizations for both the IUPAC and Division representatives.

#### **17. 2019 GA/CONGRESS, PARIS, FRANCE** **DR. SOBY /PROF. HARTSHORN**

##### **17.1 FEEDBACK ON ELECTION PROCESS AND GA SCHEDULE**

Dr. Soby discussed the feedback received on the election process was primarily focused on communication and engagements between the Secretariat/Officers and articulating responsibilities of the Division Presidents (involvement in the process), the Nominating Chairs, the development of TM ballots as well as clarity on eligibilities. (S&B)

Timelines were followed by the NAOs for their nominations. However, once received the internal mechanisms and timing/deadlines were problematic and delays occurred.

The GA Schedule feedback will be incorporated into the Montreal 2021 GA with the early ICTNS meeting (well received, but expensive). Room conditions, breaks, and other complaints are being addressed with the Canadian organizers.

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

#### 17.2 WCLM

**PROF. OBER**

Following a review of the Paris WCLM activity, Prof. Ober, Prof. Hartshorn, Dr. Meyers and Dr. Soby met to draft a proposal for the WCLM in Montreal. This will be discussed in 18.3. YOs and RYOs engagement

One major issue of the Young Observer/RYO engagement was the registration system (for all registrants). The other major issue was not having a clear, articulated program/brochure that outlines what a Young Observer is able to participate in, etc.

#### 18. 2021 GENERAL ASSEMBLY & CONGRESS, MONTREAL, CANADA

**DR. SOBY**

##### 18.1 SITE VISIT REPORT

Dr. Soby updated the EC on the Montreal site visit in October 2019.

##### 18.2 GA SCHEDULE

The GA 2021 schedule will mostly mirror the Paris schedule with the following changes:

- There will be an Awards Ceremony for ALL awards (Congress and GA and CSIC) including Poster prizes from the Congress. Thus, the IUPAC-Solvay Awards, IUPAC-NHU Awards, Division VII Poster Prizes among others will be presented. This ceremony will be open to all and followed by a dinner reception.
- This could potentially impact attendance of the Award winners (above) but we have ample time to plan for this.

##### 18.3 WCLM 2021

Key highlights of the plan for 2021 are as follows:

- The WCLM should be an Executive Committee responsibility with high level of engagement.
- The focus of the WCLM should revolve around the SDG's and a theme of Chemistry for Society.
- The Purpose of the WCLM: Engagement of CEO's (Board Level) from global Chemical companies (perhaps related industries) to discuss the role that THEY see IUPAC can play in furthering the relationship with society as well as addressing the issues they see as priorities.
- Building and maintaining relationships between IUPAC and Industry is a key outcome of the WCLM.
- Pre-WCLM meeting: time and place to meet before the WCLM
  - Breakfast with IUPAC Executives and leaders with CEOs.
  - Engagement of a speaker for the kick-off.
- WCLM Session:
  - Panel discussion with key CEOs and IUPAC representatives

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

- Discussion moderated with prepared topics and questions agreed upon by both IUPAC and CEOs.
- Include audience to pose questions to the panel for a dialogue

The Executive Committee was asked to discuss the proposal and provide input.

#### 18.4 APPLICATION FOR ENDORSEMENT AND SYMPOSIA

The application for the Montreal 2021 is in the agenda book and a list of symposia provided for inputs and review. The Application will be forwarded to the Bureau following the EC meeting. No comments were made.

#### 18.5 SPONSORSHIP/FUNDRAISING

### 19. IYCN DEVELOPMENTS

**DR. SOBY**

Dr. Soby discussed the work of IYCN stating that they are now actively engaged with IUPAC in the following:

- IUPAC is providing a separate bank account under the IUPAC accounts in order for IYCN to manage their funds and sponsorships.
- IUPAC has set up a Stripe account for IYCN to provide invoices for incoming funds. IUPAC reconciles this account on a monthly basis and advises on bank balances.
- IYCN falls under the IUPAC accounts and thus the US Audit and tax filing.
- Consultation on a number of IYCN issues is ongoing as needed.

### 20. STATUS REPORT ON IUPAC SECRETARIAT

**DR. SOBY**

Dr. Soby updated the EC on a variety of issues, including the website status, social media and its implementation during 2019 for IUPAC100. She updated the list of website editors and staff responsibilities.

A succession plan was presented which included a plan to replace Ms. Linda Tapp upon her retirement.

### 21. CIAAW PRESS RELEASE FOR EC APPROVAL

**PROF. HARTSHORN**

A draft press release from CIAAW was in the Agenda book. EC was asked to approve the release.

- The EC approved the CIAAW Press Release

### 22. IUPAC COMMITTEE FOR ISC

**PROF. TARASOVA/PROF. ZHOU**

## 158th MEETING OF EXECUTIVE COMMITTEE

### APPROVED MINUTES

#### 22.1 UPDATE ON ICSU GRANT: "A GLOBAL APPROACH TO THE GENDER GAP IN MATHEMATICAL AND NATURAL SCIENCES: HOW TO MEASURE IT, HOW TO REDUCE IT?"

**PROF. CHIU**

#### 22.2 UPDATE ON ISC: ISC ACTION PLAN FOR 2019-2021

Prof. Tarasova updated the EC on the activities of ISC in the year 2019. ISD Annual report may be found at <https://council.science/annualreport2018>. The ISC action plan may be found at <https://council.science/actionplan>

#### 22.3 ISC: VALUE PROPOSITION FOR IUPAC

### 23. MEMBERSHIP RELATIONS COMMITTEE

**PROF. TARASOVA**

Prof. Tarasova reported on the activities undertaken by the IUPAC MRC in the year 2019.

### 24. PROJECTS IN REVIEW

**DR. SOBY**

#### 22.1 PROPOSALS IN REVIEW

The deadline for submission of new projects from the 2018-2019 budgets has ended. There are currently 11 proposals in review with financial commitment of \$90,750.

#### 22.2 PROJECT AND FINANCIAL REPORT

**DR. SOBY**

The 31 October project and financial report was discussed. Dr. Soby noted the current remaining balance of the current projects (page 27) is \$656,821.

The Executive Committee was asked to approve the removal of project #2015-007-1-020 ICSU from the project report. This project was never started and should be removed from the report at this time.

- The EC Approved removing this project from the EC list of projects.
- The EC is asked to appoint a project manager for all projects contained within the EC as a matter of oversight of the EC strategic projects.

### 25. EVALUATION COMMITTEE UPDATE

**PROF. BRETT**

### 26. IUPAC-IUPAP COOPERATION

**PROF. TARASOVA**

Prof. Tarasova informed the EC of the status of the IUPAC-IUPAP relationship. She discussed the proposed MoU terms regarding collaboration and interaction with IUPAP.

- The EC discussed the terms of the MoU and plans forward towards formalizing the MoU
- Natalia will communicate with IUPAP regarding the input questions
- Lars Ohrstom will be the key negotiator with Richard Hartshorn to formalize the MoU

# 158th MEETING OF EXECUTIVE COMMITTEE

## APPROVED MINUTES

### 27. THE PHOSAGRO PROJECT

PROF. BRETT

Chris is now on the Jury of the project. Signing of the project was late at UNESCO therefore publications were also delayed. Jury met in September and decisions made in November. Publicity is very good for this program.

### 28. INChI TRUST

PROF. HARTSHORN

A report on the InChI Trust and its activities was provided to the EC for information. The essence of the report is that IUPAC has a fundamental role in InChI Trust and is tied to Division VIII and CPCDS. Richard discussed that there were some issues in communications between both organizations, but work is in process for improving the situation.

### 29. OPCW

PROF. HARTSHORN

A broader interaction with OPCW is being developed. Analytical, Environmental, Education, and Nomenclature collaborations are developing using groups that were assembled following the impromptu meeting at the General Assembly. These are being led by: Zoltan Mester, Hemda Garelick, Jan Apotheker, and Ed Constable, respectively. These groups will work to build separate liaisons with different parts of OPCW. Increased overlap with OPCW people is the objective, given past difficulties in maintaining collaborations due to turnover in both organizations. Chris Brett discussed his meeting and connections during his visit to OPCW and challenges in OPCW. He mentioned his conversation with OPCW Secretary General regarding what OPCW sees for IUPAC and how we can assist better. One area of interest is the education of Science Diplomats in chemistry-related issues.

Christopher Brett will attend OPCW and will give a speech on an annual basis (as President of IUPAC). Next year's meeting will be put into his calendar. This tradition should be continued for all IUPAC Presidents to continue the relationship with OPCW

### 30. CONFERENCE ENDORSEMENT/SPONSORSHIP PROGRAM

DR. SOBY

#### 30.1 RATIFICATION OF ENDORSEMENT/SUPPORTED SYMPOSIA

For the time period of October 2018 to November 2019, there were 4 supported conferences and 27 IUPAC Endorsed conferences approved.

- The EC ratified the conference endorsements as of 30 November 2019.

### 31. ACTION ITEMS FROM PREVIOUS MEETINGS

PROF. HARTSHORN

The cumulative action items from previous meetings were discussed. The Gender Gap project with Mei-Hung action item should be put on hold.

### 32. NEXT BUREAU MEETING

DR. SOBY/PROF. ZHOU

### 33. DATES AND PLACE OF 2020 EXECUTIVE COMMITTEE MEETING

PROF. ZHOU

158th MEETING OF EXECUTIVE COMMITTEE

APPROVED MINUTES

**34. ANY OTHER BUSINESS**

**ALL**

**18:00 ADJOURN**

**Actions from 159th MEETING OF EXECUTIVE COMMITTEE Virtual Meeting,  
10 November 2020**

[159EC02] EC to review and return comments to LM ASAP on the Minutes of 2019 158<sup>th</sup> EC meeting; *Approval to be scheduled on the Nov 25 EC call*

[158EC05] Restructure and consider how best to market the endowment; assign task to the President who will nominate a working group among the EC.

*[158EC5] 'During the discussion of the Establishment of an Endowment mechanism, the Treasurer and Vice President noted that a new narrative be created to communicate to an external audience the unique value proposition of IUPAC relative to many other organizations. [No Person Assigned]*

[159EC08] LS to arrange for a follow-up EC meeting on Nov 25, 202 to consider the Review Group report.

[159EC08] FM to schedule an informal EC meeting + Cesa & Review Group on Friday Nov 20 (from 12 to 2 EST) to discuss the report

[159EC09] RH to circulate the draft policies that are available

[159EC 10] NB to consider with the 2021 Congress planning committee the program of Plenary and not to be so limited to US representation

[159EC10] FM to follow-up with an invite for the Congress chair to present the congress plan in CI April and follow-up in July

[159EC17] LS to revise current EC detailed Agenda to clearly indicate the name of the IUPAC rep ON other organization who submitted each report

[159EC22] CB to formulate a general statement for OPCW detailing how the funds from the The OPCW Hague award will be used in IUPAC; this will echo the criteria outlined for the proposed use of the endowment funds, focusing mainly on capacity building and education; *draft to be reviewed on Nov 25*

[159EC22] CB to contact COCI and invite a proposal related to STP and capacity building that can be a priority for using the 2019 The Hague award fund in IUPAC Endowment portfolio.

[159EC25.2] Regarding ratification of endorsement for supported symposia-EC to consider defining if simple majority is the default quorum for the EC decision

*Items postponed to Nov 25*

[159EC15] EC to agree to extend the De Gruyter contract to the end of 2023 ; *to be decided on Nov 25*

[159EC15] EC to endorse a working plan to move to digital CI and explore De Gruyter option ; *to be decided on Nov 25*

[159EC25.2] FM to review and provide updated list of endorsed conferences that require ratification ; *to be ratified on Nov 25*

[159EC26] EC to finalize to date of the special Council, either Wednesday April 28, 2021, Thursday Apr 29, Wed May 5, or Thu May 6 ; *to be decided on Nov 25*

[159EC26] EC to consider the date for a Bureau to discuss the recommendation of the review group around January/February; *date to be decided on Nov 25*

[159EC26] EC to consider the date for a regular Bureau to be scheduled Saturday 10 or 17 April; *date to be decided on Nov 25*

[159EC26] EC to consider a 2021 date for a pre-GA meeting

NB: Prof. Neil Burford

LM: Ms. Lisa Musty

*(draft 11 Nov 2020)*



# Australian Academy of Science

Ian Potter House, Gordon Street, Canberra ACT 2601

*Foreign Secretary: Professor Elaine Sadler AO FAA*

22 March 2021

Dr. Lynn Soby  
Executive Director  
International Union of Pure and Applied Chemistry  
By e-mail: [lsoby@iupac.org](mailto:lsoby@iupac.org)

Dear Dr. Soby,

**Re: Letter of support for the nomination of Prof. Mary Garson as Vice-President of IUPAC**

On behalf of the Australian Academy of Science, IUPAC National Adhering Organisation for Australia, I am writing to support the nomination of Prof. Mary Garson as Vice-President of the International Union of Pure and Applied Chemistry (IUPAC).

Professor Garson has a long history of involvement with IUPAC and served in several leadership positions, most recently, as an elected Member of the IUPAC Bureau (since 2018). Professor Garson is a leading international expert in the chemistry and natural bioactivity of secondary metabolites from both the marine and terrestrial environment, including the biosynthesis of terpene metabolites in marine sponges.

Since 1994, Prof. Garson has played a proactive role in IUPAC activities and Divisions. In 1994, Prof. Garson successfully bid to host the IUPAC General Assembly and Scientific Congress in Brisbane, Australia in 2001 and served as Executive Secretary of the Organising Committee. First as Titular Member (2006-2007) and Secretary and then President (2014-2015) of IUPAC Division III, Prof. Garson has been heavily focussed on facilitating communication and decision-making, to strengthen the impact of the Division's activities. In 2011, Prof. Garson created and convened the first global Women in Chemistry breakfast event, which now runs annually and engages participants from around the globe.

With a unique set of skills and experiences and internationally recognised expertise, Prof. Garson is ideally suited to leading and advancing the priorities of IUPAC and as such, on behalf of the Academy, I strongly support Prof. Garson's nomination as Vice-President.

Yours sincerely,

Elaine Sadler AO FAA

**Foreign Secretary**

## Biographical Sketch - Emeritus Professor Mary Garson AM

My involvement with IUPAC began in 1994 when I facilitated a bid for Australia to host the General Assembly and Scientific Congress in Brisbane. I was the Executive Secretary of the Organizing Committee which successfully delivered these combined meetings in 2001.

Since 2018, I am an elected Member of the IUPAC Bureau; as a member of the Evaluation Committee, I have been assessing the project system. I joined Division III (organic & biomolecular) as a Titular Member (2006-2007), then as Secretary, and was the Division President for the 2014-2015 biennium. Within the Division, a focus has been on facilitating communication and decision-making. I have been an Associate Member of the Committee for Chemistry Education, and have contributed to projects in both Division III and in CCE. I have organized international meetings on behalf of Division III.

In 2011, I created and convened the global breakfast event *Women Sharing a Chemical Moment in Time* for the International Year of Chemistry, in which 40 countries shared events with each other through social media. I introduced a video item at the IYC Opening Ceremony in Paris.

Between 2016-2019, I was the co-chair (with Dr. Laura McConnell) of the IUPAC100 Management Committee to celebrate the centenary of IUPAC. We scripted a commemorative piece on IUPAC for the 50th GA/47th WCC in Paris. Key initiatives included (i) IUPAC Stories; (ii) Periodic Table of Younger Chemists; (iii) Periodic Table Challenge; (iv) Global Women's Breakfast.

I am co-leader of the project task group *Creation of IUPAC Global Women's Breakfast Series and a Global Network in Support of Eliminating the Gender Gap in the Chemical Sciences*. This year, our network hosted 324 events in ~70 countries; when surveyed, ~60% of respondents "indicated an increased attention to diversity issues in their organization."

Other leadership roles have included as Chair of the International Relations Committee of the Royal Australian Chemical Institute (1996-2004), with membership of the National Committee for Chemistry; this committee reports to the Australian Academy of Sciences, the NAO to IUPAC. I was Chair of the Board of Australian Science Innovations (2002-2005), a premier provider of challenging science programs, and which oversees Australia's participation in international science Olympiads. I led the national committee organizing the 15th International Biology Olympiad.

I have worked in the UK, Italy, USA and Australia, and been an active participant in research collaborations, meetings and workshops in the Asia-Pacific region for >30 years.

# Emeritus Professor Mary J Garson AM

## Personal Details

Full name: Mary Jean GARSON  
Citizenship: Dual Australian/British nationality  
Contact details: +61-402-715-893 (Ph); [m.garson@uq.edu.au](mailto:m.garson@uq.edu.au) (Email); @MMaryGarsonae (Twitter)

## Academic Record and Qualifications

- PhD, University of Cambridge UK, 1977, *The Biosynthesis of Polyketides* (with Prof J Staunton).
- MA (1978) and BA (Hons) University of Cambridge UK (1974, natural science tripos, part II chemistry).

## Professional Experience

- Professor of Chemistry, School of Chemistry and Molecular Biosciences (SCMB), The University of Queensland, 2006- 2020; (Emeritus Professor 2021-).
- Deputy Head of School (SCMB), The University of Queensland, 2005-2009.
- Earlier positions at The University of Queensland: Associate Professor (1998-2005)/Senior Lecturer (1992-1997)/Lecturer (190-1991).
- Earlier positions at The University of Wollongong: Senior Lecturer (1990)/Lecturer in chemistry (1986-1989).
- Queen Elizabeth II Research Fellow, James Cook University of North Queensland, 1983-1986.
- Medicinal chemist, Smith Kline and French Research Ltd., Welwyn UK, 1981-1983.

## Awards and Fellowships (selection only)

- Member (AM), The Order of Australia, for significant service to education and to women in science, 2019.
- Royal Society of Chemistry Australasian lectureship, 2018 (by invitation).
- Excellence in Leadership award, The University of Queensland, 2018.
- Inaugural recipient, Margaret Sheil “Women in Chemistry” leadership award of RACI, 2017.
- Named as one of the “175 Faces of Chemistry” by the Royal Society of Chemistry, UK, 2014.
- Distinguished Woman in Chemistry or Chemical Engineering award of IUPAC, 2013.
- Fellow of the Royal Society of Chemistry (RSC) elected 2013.
- Leighton Memorial Medal of the Royal Australian Chemical Institute, 2011, awarded for distinguished service to the Institute in the broadest sense.
- Inducted into *Everyday Women, Extraordinary Lives* tribute gallery, QLD government initiative, 2011;
- National citation for contributions to Royal Australian Chemical Institute (2001).
- Fellow of the Royal Australian Chemical Institute (RACI), elected 1993.
- Queen Elizabeth II Research Fellowship (James Cook University of North Queensland), 1983-1986.
- College Research Fellowship, Murray Edwards College (New Hall) Cambridge UK, 1978-1981.
- Overseas Research Fellowship, Royal Society of London (Rome), 1977-1978.
- UK postgraduate scholarship (Science Research Council; 1974-1977) & Bathurst scholarship (Newnham College, 1976-1977) held at the University of Cambridge.

## Professional Service (Professional Societies/NGOs)

### *International Union of Pure and Applied Chemistry (IUPAC)*

- Elected Member, IUPAC Bureau for 2018-2019 and for 2020-2021.
- Chair, IUPAC100 Management Committee reporting to the IUPAC Bureau (2016-2019).
- Member, Australian delegation to the Council meetings of the IUPAC General Assembly, 1999-2017.
- President of Division III (organic and biomolecular), and member of IUPAC Bureau, 2014-2015.
- Titular Member (Division III), 2006-2017 (including as Secretary (2008-2011), Division Vice-President (2012-2013), Division President (2014-2015) and Past President (2016-2017); evaluation of project proposals; Associate member of Committee for Chemical Education (CCE) (2008-2012, 2016-2017).
- Creator and international convener *Women sharing a chemical moment in time*, global networking activity (2011); video presentation at Opening Ceremony of the International Year of Chemistry at UNESCO Paris.

- Co-coordinator, *IUPAC Global Women's Breakfast Network*, 2019-current;
- Executive Secretary organizing the IUPAC General Assembly, Brisbane, 2001; Member of Organizing Committee, IUPAC World Chemistry Congress, Brisbane, 2001.
- Co-chair, Organizing Committee, 27th International Symposium on the Chemistry of Natural Products/7th International Conference on Biodiversity, 2011.

#### ***Royal Australian Chemical Institute (RACI)***

- Chair, International Relations Committee RACI; Member National Committee for Chemistry, 1996-2004;
- President, Queensland branch and member of Full Council of RACI, 1996-1997; committee member (1991-1999) and secretary (1994-1995) of Queensland-RACI; committee member (1991-1997), Chemical Education Group of Queensland-RACI; committee member, Wollongong section, NSW-RACI, 1987-1989; organiser, RACI titration competition, Wollongong section, NSW-RACI, 1987-1989.

#### ***Australian Science Innovations (= Australian Science Olympiads)***

- Chair of Board, Australian Science Innovations/Rio Tinto Australian Science Olympiads, 2002-2005; member of Board, Rio Tinto Australian Science Olympiads, 2000-2002; accompanied competition teams to 4th Asian Physics Olympiad (2003) and 14<sup>th</sup> International Biology Olympiad (Belarus, 2003); hosted official visits involving industry partnership dinners and public lectures.
- Chair, Organizing Committee 15th International Biology Olympiad (Brisbane, July 2004).

#### ***UNESCO regional network for the Chemistry of Natural Products in SE Asia***

- National point of contact representative (NPCR) for Australia (1996-2003); member, Australian delegation to the World Conference on Science (UNESCO), Budapest, 1999.

#### **Other Professional Contributions (selection only)**

- Co-chair, CHEMBIOTEC symposium (World Chemistry Congress, Italy, August 2007; with Professor F. Nicotra); member, organizing committees, 13th Int. Conference on Metabolomics (2017); Australia-New Zealand Magnetic Resonance meeting (2017); 17th Int. Biotechnology Symposium (2016); Australian Coral Reef Society meeting (1997); 15th divisional meeting in organic chemistry, RACI (1991).
- Membership of International Advisory Boards: 17th IBS (2016), ICOS (2014, 2016); World Chemistry Congresses (2013, 2015); ISCNP/ICOB (2002-2018); MaNaPro (2004, 2007); ASOMPS (2003-2020).
- Member, panel reviewing the teaching of chemistry at Victoria University of Wellington, NZ (2016).
- Advocacy and mentoring for Women in Science includes: presentation to Ministerial Advisory Committee for Queensland Women (1998); discussion leader, RACI Heads of Department of Chemistry meetings (1997, 1995) and at career advancement workshops (2009, 1996, 1995); invited speaker, Conference on Status of Women in Universities, (1995); opinion articles, radio interviews, talks (1994-present); co-organiser "Women in Organic Chemistry" symposium RACI, Perth, December 2018.
- Advocacy on biodiversity issues includes: plenary speaker, Biobusiness conference (1998); presenter, UNESCO-funded workshop, Kuala Lumpur (1996); media forum on biodiversity, Sydney (1995); Round Table sessions in Asian Symposia on Medicinal Plants, Spices & Other Natural Products (1994, 1998, 2003); expert witness to Commonwealth-State working group *Access to Biodiversity* (1994).

#### **Research Contributions (ORCID 0000-0001-8670-1075)**

- >200 research publications in international quality peer-reviewed journals.
- Plenary (15) and invited (45) lecture presentations at international meetings in chemistry or marine science; invitations to Gordon research conferences include short talks (2); main lectures (2); discussion leader (2); invited or plenary speaker at regional or national meetings in marine science, biodiversity and biobusiness.
- Research funding (Australia Research Council etc.) totaling >\$5m (AUD).
- Member, editorial boards *ACS Omega* (2016-), *J. Nat. Prod.* (2014-), *Phytochemistry* (2008-2019), *Comp. Biochem. Physiol.* (1994-1995); reviewer for >20 journals and for grant agencies.

#### **Teaching and Mentoring Contributions**

- Research supervision of 32 PhD or MSc candidates, 21 Honours students; mentoring of 6 postdoctoral fellows and of 22 international visiting scholars; undergraduate teaching in organic chemistry (UQ: 1990-2020; UoW 1986-1990) and in field-based marine chemical ecology (UQ).
- Regional workshops on marine natural products (Thailand 2007, 1999, Malaysia 2001, Brazil 1999).
- Member of award-winning UQ first year chemistry teaching team – winner of Australian Awards for University Teaching Award for Programs that Enhance Learning (APEL, 2017).

## **Supporting Statement – Emeritus Professor Mary Garson AM**

The mission of IUPAC can be summarized as "...providing scientific expertise and developing essential tools relating to chemical knowledge for the benefit of humankind". A set of six core values further guide IUPAC in its relationship with stakeholders.

With >20 years' experience in the Union, including both as a Division President and Elected Bureau Member, I am deeply familiar with the scientific work on symbols, nomenclature, measurements, standards, and terminology. IUPAC is also about global chemical issues of societal impact, and the immense value that flows from the contributions of the many individual volunteers, staff, and stakeholders. IUPAC has always appealed to me as a collegial scientific "family". In 2020, much of the core scientific work, as well as networking and educational activities, slowed significantly because of the global pandemic. An organizational structure review group recommended a new governance structure, improvements to lines of communication, and commented on membership issues. Against this challenging background, the key issues about which I am passionate include:

**Developing strategic initiatives on emerging issues in the chemical sciences:** The goal for IUPAC must be to generate projects that focus on issues of strategic importance to chemistry. Pertinent to this is the annual selection of the Ten Top Emerging Technologies in Chemistry, as well as the discussion on new research themes in the chemical sciences presented in the review group report. We need to better align our project activities with these emerging scientific trends as well as the big picture global themes of sustainability, big data, artificial intelligence, safety and risk management. The project system, first implemented in 2001, has been successful in many ways, but has become workload-intensive while some individual projects have received inadequate evaluation or performance review. We must work cooperatively as a Union to revitalize the project system, its scientific focus, and its evaluation.

**Embracing the younger generation:** The future of chemistry lies in the actions and activities of the next generation of talented and creative researchers and educators. IUPAC must extend its interactions with early career groups, including the energetic International Young Chemists Network (IYCN). We need to strengthen the contributions of these groups to our scientific work. The recent Global Women's Breakfast (GWB2021) event revealed the enthusiasm of many young chemists, both men and women, for the work of IUPAC.

**Increasing the global reach of IUPAC:** Participants in GWB2021 came from 70 different countries, while players from >135 countries/territories took the Periodic Table Challenge during 2020. We must facilitate networking interactions that enhance the diversity of IUPAC and its membership. We should continue encouraging online symposium or workshop activities that allow wider participation by the global chemistry community.

**Revitalizing IUPAC finances:** during 2020, decreased project proposal activity and meeting cancellations have eased some of IUPAC's immediate financial concerns. As the global situation improves, the Union must reach out, inform stakeholders, and develop stronger partnerships with current and future NAOs, associated organizations, chemical industry and academia.

For the last 100 years, IUPAC has guided the global chemistry community to scientific consensus and well-defined terminology. My experience and accomplishments, both within and external to IUPAC, have well positioned me for a leadership role within the Union. I decided to nominate for the Vice-President/President-Elect position so that I could lead delivery of solutions to the many challenges that face us. I ask for your support so that I can work together with all of you to add value to the global network of IUPAC, and best resource its exceptional and unique scientific work.





Prof. Nili Cohen  
President

פרופ' נילי כהן  
נשיאה

11<sup>th</sup> March 2021

Dr. Lynn Soby  
Executive Director  
IUPAC Secretariat  
Research Triangle Park, NC  
Email: [executivedirector@iupac.org](mailto:executivedirector@iupac.org)

Dear Dr. Soby,

It is my pleasure to send you the attached nomination of Prof. Ehud Keinan, Benno Gitter & Ilana Ben-Ami Professor of Chemistry at the Schulich Faculty of Chemistry, Technion - Israel Institute of Technology and Israel's long-serving representative to IUPAC, as a candidate for president of the organization.

Prof. Keinan has served as Israel's representative to IUPAC since 2015 and has been deeply involved in the organization's activities since then, serving as Bureau member since 2016.

As president of the Israel Chemical Society, Editor-in-Chief of both national and regional publications, and a deeply involved, passionate and active academic in his field and in the international chemical community, I believe that Prof. Keinan is an ideal and excellent candidate for the presidency of IUPAC, and give my full support to his application.

Sincerely,

*Nili Cohen*

Prof. Nili Cohen  
President  
Israel Academy of Sciences and Humanities

## **Ehud Keinan - CV**

DOB: July 6, 1947, Ramat Hasharon, Israel  
Marital status: Married, 6 children, 9 grandchildren  
Citizenship: Israel, USA  
Address: Schulich Faculty of Chemistry, Technion, Haifa 3200003 Israel.  
Home Add.: 8 Moran Street, Timrat 365760, Israel.  
Phone: +972-54-4526623 E-mail: keinan@technion.ac.il  
Website: <http://www.ehudkeinan.com>

### **Academic Degrees**

1968-1971 B. Sc. in Chemistry, Tel Aviv University, Israel.  
1971-1972 M. Sc. in Chemistry, Ben Gurion University, Beer Sheva, Israel.  
1972-1977 Ph. D. in Organic Chemistry, Weizmann Institute of Science (Y. Mazur), Israel.  
1977-1980 Post-doc University of Wisconsin (B. M. Trost), Madison, Wisconsin.

### **Academic Appointments**

2020- Distinguished Visiting Chair, Academia Sinica, Taiwan  
2015-2016 Pro-Vice Chancellor and Dean of Sciences, GTIIT, Guangdong, China.  
2004-2006 Dean, Faculty of Chemistry, Technion, Israel.  
1999-2004 Founder and Head, Institute of Catalysis Science and Technology, Technion.  
1991-2014 Adjunct Professor, The Scripps Research Institute, La Jolla, CA.  
1995- Professor of Chemistry, Department of Chemistry, Technion.  
1987-1995 Associate Professor, Department of Chemistry, Technion, Israel.  
1980-1988 Senior Scientist, Associate Prof., Dept. Organic Chemistry, Weizmann Institute.

### **Research interests**

Biocatalysis with antibodies and with synthetic enzymes, organic synthesis, molecular-computing devices, supra-molecular chemistry, improvised explosives and drug discovery.

### **Teaching experience**

Main-group organometallics in organic synthesis, Transition-element organometallics in organic synthesis, General Chemistry, General Chemistry laboratory, Introductory chemistry, Advanced organic chemistry – Biocatalysis, Advanced organic chemistry lab, Structure determination by physical methods.

### **Technion activities**

2008-2012 Member of the Inter-Senate Committee of the Israeli Universities.  
2006-2012 Chairman of professional committees for Tenure and Promotions.  
1999-2004 Founder and Head, Institute of Catalysis Science and Technology.  
2001-2003 Member of permanent committee for Tenure and Promotions.  
1999-2001 Member of the Senate preparatory committee for Tenure and Promotions.  
1999-2004 Member of professional committees for Tenure and Promotions.  
1995-1999 Vice-Dean and Chairman of the Teaching Committee of Chemistry,  
1995-1999 Head of Graduate and undergraduate programs of Chemistry, Technion  
1995- Member of the Technion Senate.  
1989-1991 Representative of the Department of Chemistry to the Senate.  
1988-1991 Member of the Interdisciplinary Committee for Biotechnology.  
1988-1991 Member of the Teaching Committee of Chemistry, Dept. of Chemistry.

### **Main public professional activities**

2020- Chairman, Scientific Advisory Board, Bowei Research Conferences, Taiwan.  
2020- Editor-in-Chief, *AsiaChem*, official magazine of the FACS  
2019- Member of the Executive Committee, FACS  
2016- Member of the Bureau, IUPAC (two terms).  
2015- Member of the Council of the Wolf Foundation.  
2009- President of the Israel Chemical Society (5 terms of 3 years each).  
2008- Chairman, Advisory Council of High School Chemistry, Ministry of Education.

2012-2015 Member of the Executive Board, EuCheMS.  
 2008- Editor-in-Chief, *Israel Journal of Chemistry*, Wiley-VCH, Weinheim, Germany.  
 2003- President, International Forum of Bio-Inspired Engineering (ISBIE), Boston.  
 1999- President, Middle East Research Institute (MERIT Foundation), New York.

Other activities: founder of the Archimedes national project, the Negev-Nobel national project the new format of the Chemistry Olympiad, initiated bilateral agreements between the ICS and the chemical societies of Germany, The Netherlands, Spain, Czech Republic, Japan and the USA. Initiated and designed four Israeli stamps commemorating the Nobel Prizes in Chemistry awarded to 6 Israeli scientists. Public writer and activist on topics of science education, higher education, public policy on energy and chemical industry.

### **Awards and Honors**

Joseph and Madeleine Nash Career Development Chair, Fondation Madelon (1985). New England Award for Academic Excellence (1990), Shannon Award, NIH (1992), CapCure Award (1995), Benno Gitter and Ilana Ben Ami Chair in Biotechnology (1997), Technion Prize for security technologies (2004), Henri Taub Prize for Academic Excellence (2006), Fellow, AAAS (2010), Schulich Prize for the Promotion of Extraordinary Academic Activities (2012), Makor Rishon magazine: "Man of the Year" (2017), Asia-Pacific Triple E Awards: Engagement Leader of the Year Award (2020), EuCheMS Award of Service (2020).

### **Conference organizing committees**

Since 1980: over 100 national and international conferences, including nearly 40 Annual Meetings of the ICS, all ICS Symposia in honor of the Wolf Prize Laureates, such as S.L. Buchwald and J. F. Hartwig (2019), M. Fujita and O.M. Yaghi (2018), R.G. Bergman (2017), K.C. Nicolaou and S.L. Schreiber (2016), C.H. Wong (2014), R. Langer (2013), A.P. Alivisatos and C.M. Lieber (2013), S.A. Rice, C.W. Tang and K. Matyjaszewski (2011), H.B. Gray (2004), H.B. Kagan, R. Noyori and K.B. Sharpless (2001), F.A. Cotton (2000), G. Stork and S.J. Danishefsky (1996), R.A. Lerner and P.G. Schultz (1995). Chairman of all International Symposia on Bio-Inspired Engineering, Chairman: The International Year of Chemistry 2011, Knesset, Jerusalem. Chairman of the special meeting celebrating 20 years of Wolf Prizes and 50 years of Israel independence, Jerusalem, 1998. Chairman, Scientific Advisory Board, Bowei Research Conferences, Taiwan.

### **Publications**

About 200 research papers in high profile journals (*Nature*, *Nature Communications*, *Nature Biotechnology*, *Proc. Natl. Acad. Sci. USA*, *J. Am. Chem. Soc.*, *Chem. Sci.*, *Angewandte Chemie*, *ChemBioChem*, *Chem. Eur. J.*, *Chem. Commun.*, *Chemistry & biology*, *Langmuir*, *Development*, *PCCP*), 22 patents, 4 books, over 25 editorials, and over 40 OpEd articles on higher education policy, science education policy, natural gas policy, and safe chemical industry and government policy. Several Affidavits submitted to the Israeli Supreme Court, over 20 detailed Conference Reports, over 100 articles covering prize laureates. Over 200 presentations in international conferences and symposia, including plenary and keynote lectures.

**Prof. Ehud Keinan** is Benno Gitter & Ilana Ben-Ami Professor of Chemistry at the Schulich Faculty of Chemistry, Technion - Israel Institute of Technology. He was born and educated in Israel, Ph.D. from the Weizmann Institute of Science with Prof. Y. Mazur and postdoc at the University of Wisconsin with Prof. B.M. Trost. His interest fields include biocatalysis with antibodies and synthetic enzymes, organic synthesis, molecular-computing, supra-molecular chemistry, improvised explosives, and drug discovery. He has published nearly 200 research papers, 22 patents, and four books. He was Dean of the Technion Schulich Faculty of Chemistry, was an Adjunct Professor at The Scripps Research Institute, La Jolla, California (1991-2014), was the founder and first Head of the Institute of Catalysis Science and Technology (ICST) in the Technion and founded two startup companies. He served as Pro-Vice-Chancellor and Dean of Sciences, GTIT, Guangdong, China (2015-2016), and since 2020 he holds a Distinguished Visiting Chair at the Academia Sinica, Taiwan. Keinan initiated and led several national projects in Israel, including the Archimedes and Negev-Nobel projects, promoting gifted high-school pupils, and the Chemistry Olympiad. He designed and produced four Israeli stamps commemorating the Nobel Prizes in Chemistry awarded to 6 Israeli scientists. Keinan is a public writer and activist on science education, higher education, public policy on energy and chemical industry.

Keinan's public service includes: Editor-in-Chief of the Israel Journal of Chemistry (Wiley-VCH), since 2009, President of the Israel Chemical Society (since 2009), Member of the Executive Committee and Director of Communications at the Federation of Asian Chemical Societies (FACS), Editor-in-Chief of the AsiaChem magazine, Founder and first Editor of the ICE magazine, was Member of the Executive Board of EuChemS (2012-2015), Member of the Council of the Wolf Foundation, Chairman of the Advisory Council of High School Chemistry at the Ministry of Education (since 2009), Chairman of the Scientific Advisory Board of the Bowei Research Conferences, Member of the IUPAC Bureau (2016-2023), and Member of IUPAC Evaluation Committee.

Keinan received the New England Award for Academic Excellence, the Shannon Award, the CapCure Award, the Herschel-Rich Award, the Technion Prize for security technologies, the Henri Taub Prize for scientific excellence, and the Schulich Prize, the Engagement Leader of the Year Award from the Asia-Pacific Triple E Awards, and Award of Service from EuChemS. The Makor Rishon magazine selected him as "Man of the Year" of 2017. Since 2010 he is an AAAS Fellow.

## Ehud Keinan: 2022 Vice Presidential Candidate Statements

This statement outlines the main goals I wish to achieve during my service as IUPAC Vice President and later as President. Most of these ideas are not new but based on my years of experience in public service. In a way, I intend to extrapolate from my previous and current responsibilities listed below and use them as a pilot for the proposed larger-scale goals.

1. Israel Chemical Society: President, since 2009, reelected for the 5<sup>th</sup> term until 2023.
2. IUPAC Bureau member, two terms (2016-2023). Member of the Evaluation Committee.
3. *Israel Journal of Chemistry*, Wiley-VCH, Editor-in-Chief. since 2008.
4. *Israel Chemist and Chemical Engineer* (ICE magazine), Founder and first Editor.
5. *AsiaChem* Magazine, Founder and Editor-in-Chief, since 2020.
6. Federation of Asian Chemical Societies (FACS), ExCo member and Communications Director, since 2020.
7. European Chemical Society (EuChemS), member of the Executive Board, 2012-2015.
8. American Chemical Society Chapter in Israel, Founder and President, since 2020.
9. Wolf Foundation, Council Member, the Wolf and Krill Prizes committees, since 2016.
10. Israel Ministry of Education, Advisory Council for Chemistry, Chairman, since 2008.
11. Technion Institute of Catalysis, Founder and first Head, 1998-2002.
12. Technion – Israel Institute of Technology, Dean of Chemistry, 2002-2003.
13. GTIIT, Shantou, Guangdong, China, Pro-Vice-Chancellor and Dean of Sciences, 2015-2016.
14. Founder of Israeli national projects: Archimedes, Chemistry Olympiad, Negev-Nobel, science stamps.

Some of my proposed plans concerning finance, membership, prizes, and publications are listed below.

**Finance:** I consider IUPAC's current financial situation as the most urgent challenge we need to meet. In my view, IUPAC is underfunded, too dependent on income from national subscriptions, and financially insecure for the long term. Rather than severe budget cuts, I propose seeking income from additional sources. Rather than reduction, I suggest expanding activities, new initiatives, new prizes, and enhanced global stature, which will eventually increase revenues. I intend to apply strategies I've found useful in my abovementioned experience:

- As Founder of the Technion ICST, I raised over \$10 million from philanthropic sources in California.
- As Dean of Chemistry, I have initiated a \$50 million naming gift for the Faculty of Chemistry.
- As ICS President, I have increased the ICS financial assets by 15-fold, established two endowment funds and other assets that secure income-independent operation for the foreseeable future.

To achieve a robust financial basis for IUPAC, I plan to apply three experimentally proven strategies:

- A. Visit presidents or CEOs of major global corporations to explore overlapping interests and establish mutually agreed collaboration modes.
- B. Establish an endowment fund for IUPAC by seeking contributions from the private sector, family foundations, and other philanthropic entities.
- C. Explore long-term relations and specific funding opportunities with national and international organizations, such as NIST (nomenclature), OPCW (inspection labs), World Bank (information philanthropy), United Nations (educational and cultural programs), etc.

**Membership:** Work with the potential NAOs to find specific solutions to their financial problems and allocate either corporate or governmental sponsors to help with their National Subscription.

**Prizes:** Establish new, prestigious IUPAC prizes, all supported by endowment funds.

**Publications:** Enhance IUPAC publications' global visibility. Create an IUPAC body to support national scientific journals worldwide, help them achieving internationally recognized standards, unified software, and enhanced reputation.



# INSTITUT KIMIA MALAYSIA

MALAYSIAN INSTITUTE OF CHEMISTRY

(Inaugurated on 8 April 1967, incorporated under Chemists Act 1975 on 1 November 1977)

127B, JALAN AMINUDDIN BAKI, TAMAN TUN DR ISMAIL, 60000 KUALA LUMPUR

TEL: 603-7728 3272 FAX: 603-7728 9909

EMAIL: [ikmhq@ikm.org.my](mailto:ikmhq@ikm.org.my)

WEBSITE: <http://www.ikm.org.my>

FACEBOOK: Institut Kimia Malaysia

President: Datuk ChM Dr. Soon Ting Kueh

15 March 2021

**Dr. Lynn M. Soby**

Executive Director, IUPAC

IUPAC Secretariat

PO BOX 13757

Research Triangle Park,

NC 27709-3757, USA

## Institut Kimia Malaysia Nomination - Datuk Dr SOON Ting Kueh

On behalf of Institut Kimia Malaysia (IKM) Council, we would like to nominate **Datuk Dr SOON Ting Kueh**, IKM President, to stand for election as a IUPAC Bureau member as well as Vice President.

Thank you.

Yours sincerely,

.....  
**Datin Dr Zuriati Zakaria**

IKM Vice President



## SOON Ting-Kueh (Ph. D.)

If I were to be elected as **Vice President** of International Union of Pure & Applied Chemistry (IUPAC) .....

To me, IUPAC is more than the naming of organic compounds, inorganic complexes, macromolecules and new elements. IUPAC is **global chemistry**, **inclusive** and **diversified** and covers all aspects of life.

IUPAC is advancing chemistry for new knowledge, feeding the world, improving the quality of life and sustaining life on earth for an infinite time. But in order for us to do all these, we must start right from the bottom.

IUPAC means **inclusiveness**. We must cover all areas of humanity, from people in the rich economies to those living in the poorest conditions. First thing is for IUPAC to reach out to countries with poor science education and resources, but with a potential to develop their chemistry capacity and capability. IUPAC, together with other corporate giants, can help to improve their chemistry capability in providing basic and university education, research grants, equipment and other resources including IT infrastructure. We must assist in providing chemistry education in schools, increasing scientific capacity and capability in university and facilitate research and development in science and technology.

IUPAC also means **diversity**, covering all people irrespective of race, gender, religion and social status. We have to reach out to the minority in each community, the very poor or neglected, to provide them with basic education and understanding of chemistry and what chemistry means in everyday life. Chemistry is for the common good to provide food on the table, clothes to keep you warm and safe, a comfortable place to live in, good physical and mental health, and a good and meaning full life.

IUPAC also means **chemistry sustaining life** on earth. Chemistry must play its roles in improving the quality of life on earth, ensure sustainable development and a clean and safe environment and ecosystem.

After saying all these glamorous things, what should IUPAC do?

First is closer communication and collaboration with our NAOs. IUPAC forming a Network of IUPAC/NAOs to maintain close communication, collaboration and partnerships with NAOs including an e-Newsletter. Assisting the NAOs in developing economies to further develop their chemistry capacity and capability.

IUPAC working closely with regional chemistry groupings such as the Federation of Asian Chemical Societies (FACS), the European Association for Chemical and Molecular Sciences (EUChMS), the Federation of African Societies of Chemistry (FASC) and Latin American Federation of Chemical Societies (FLAQ) in further developing chemical sciences in various regions of the world and maintaining close communication on the latest development of chemistry and industry in various regions.

IUPAC identifying a few least developing countries in Africa, Latin America and Asia in the coming years and assisting them to set up chemical societies and developing their chemistry resources and infrastructure. Our final target will be that every country must have a chemistry society or group that can engage with the government to put chemistry to work for better quality of life for all.

This is in addition to what IUPAC has been doing at this moment. We may have to take a generation to do all of the above but every journey starts with the first step.



## BIOGRAPHICAL SKETCH

Name: **SOON Ting-Kueh (Ph. D.)**

**Datuk Dr Soon Ting-Kueh** is President of Institut Kimia Malaysia (IKM) since 2018 and currently a Titular Member in the IUPAC CCE.

### Education, Academic Career and Research

Dr Soon graduated from University of Malaya with B. Sc. Hons (Chemistry) in 1972 and obtained his Ph. D. from the same university in 1975. His areas of research and work include physical organic chemistry, oils and fats chemistry and technology, oleochemicals and biofuels, and chemistry education.

### Institut Kimia Malaysia (IKM)

Datuk Dr Soon is IKM President and he is actively involved in advancing chemical sciences and chemistry education. He is the Chairman of IKM Chemical Education and Community Section Committee since 1988 and serves in a number of Academic Advisory Boards of Malaysian universities. He is also a member of the National Council on the Teaching of Mathematics and Science under the Ministry of Education Malaysia. For his contribution to chemistry education, IKM presented him with the **Tan Sri Dato' Seri Law Hieng Ding Award** in 2010.

### Organisation for the Prohibition of Chemical Weapons

Datuk Dr Soon also served as a member of the Temporary Working Group on Education and Outreach in the Organisation for the Prohibition of Chemical Weapons (OPCW) from 2012 – 13.

### Federation of Asian Chemical Societies (FACS)

Dr Soon is also very active in the Federation of Asian Chemical Societies (FACS), being its President (2007 – 2009) and serves in various positions in FACS Council until present.

### International Union of Pure & Applied Chemistry (IUPAC)

Datuk Dr Soon plays an active role in IUPAC. He is actively involved in the International Year of Chemistry (IYC) 2011 as a Member of the IUPAC IYC Management Committee. He is also a Titular Member in CCE from 2018.

At the IUPAC 50GA in Paris in 2019, IKM won the bid to organise the IUPAC 53rd General Assembly and 50th World Chemistry Congress in Kuala Lumpur, Malaysia in 2025 and also the right to organise the 51st IUPAC World Polymer Congress (MACRO) in Kuching, Malaysia in 2026.

Datuk Dr Soon has been very active in promoting the advancement of chemistry in Malaysia and Asia. IKM organizes many international conferences such as the 7th Asian Chemical Congress (7ACC) in 2007 and the annual International Congress on Pure and Applied Chemistry (ICPAC) since 2016.

In 2012, Dr Soon was conferred a **Honorary Doctorate** by the Kazan National Research Technological University, Republic of Tatarstan, Russia and in 2013, he was admitted as a **Honorary Fellow** of the Singapore National Institute of Chemistry. For his contribution to the advancement of chemistry in Asia and the Pacific, Datuk Dr Soon is awarded the **FACS Citation Award** in 2015.



## CURRICULUM VITAL

Name: **SOON Ting-Kueh (Ph. D.)**

Affiliation: Institut Kimia Malaysia (IKM)

**Datuk Dr Soon Ting-Kueh** is the President of Institut Kimia Malaysia (IKM) since 2018, He is the Past President of the Federation of Asian Chemical Societies (FACS) from 2007 – 2009 and has served in FACS Executive Committee in various capacities since 2005.

He is currently a Titular Member in the IUPAC Committee on Chemistry Education (CCE). He served as a Titular Member of the IUPAC Committee on Chemical Research Applied to World Needs (CHEMRAWN) from 2011 – 2018.

### Education, Academic Career and Research

Dr Soon graduated from University of Malaya with B. Sc. Hons (Chemistry) in 1972 and obtained his Ph. D. majoring in physical organic chemistry from the same university in 1975. His areas of research and work include physical organic chemistry, atmospheric chemistry, oils and fats chemistry and technology, oleochemicals and biofuels, and chemistry education.

### Involvement in IKM, FACS, IUPAC and OPCW

#### Institut Kimia Malaysia (IKM)

Datuk Dr Soon has been playing a very active role in Institut Kimia Malaysia (IKM) since he first joined the IKM Council in 1988. He became IKM President from 2007 and served until 2014. In 2018, he returned as IKM President and served until present.

He is actively involved in chemistry education both within and outside Malaysia. He is the Chairman of **IKM Chemical Education and Community Section Committee** since 1988. Under his chairmanship, the Section publishes 21 volumes of **Kimia Kini** which is distributed free to all secondary schools in Malaysia. The Section also organised many activities in chemical education and public appreciation and understanding of chemistry including the following:

- **Kuiz Kimia Kebangsaan Malaysia**” or **K3M** which is an annual national chemistry quiz started in 2002 with 10,399 students taking part and increasing steadily over the year to 39,068 in 2021,
- **Karnival Kimia Malaysia (K2M)** which is an annual public understanding of chemistry function aimed at secondary school students and the general public started in 2006. and
- Involved in the training of Malaysian students taking part in **International Chemistry Olympiad** or **IChO** since 2006

#### Tertiary Chemistry Education

At the tertiary level, Datuk Dr Soon serves in the Academic Advisory Board of a number of universities in Malaysia. He was also the Chairman of the IKM Examination Board that conducts the IKM Parts I & II Examinations for IKM Membership until 2013.

Datuk Dr Soon also serves as a member of the **National Council on the Teaching of Mathematics and Science** under the Ministry of Education Malaysia.

For his contribution to chemical education and public understanding of chemistry, IKM presented him with the **Tan Sri Dato’ Seri Law Hieng Ding Award** in 2010.

#### Asian Chemical Editorial Society (ACES)

At the international level, Datuk Dr Soon represents IKM in the Asian Chemical Editorial Society (ACES) which publishes the **Chemistry – An Asian Journal** by Wiley-VCH.

### **Organisation for the Prohibition of Chemical Weapons**

Datuk Dr Soon Ting Kueh also served as a member of the Temporary Working Group (TWG) on Education and Outreach under the Science Advisory Board (SAB) of the Organisation for the Prohibition of Chemical Weapons (OPCW). He had taken part in a number of international meetings on Education and Outreach of the Chemical Weapons Convention (CWC) including a Asian Meeting of OPCW National Authorities (NAs) held in Beijing in May 2015 and an Ethics Guidelines Workshop held in OPCW Headquarters in The Hague in September 2015. He also serves as a member of the Advisory Board on Education and Outreach of the Malaysian CWC National Authority.

### **Federation of Asian Chemical Societies (FACS)**

Dr Soon is also very active in the Federation of Asian Chemical Societies (FACS), being its President (2007 – 2009), the Coordinator of Projects from 2011 – 2015 and Treasurer from 2016 – 2019. His involvement with FACS started as early as 1995 when he served as Editor of Publications. He is very active in the Asian Chemical Education Network (ACEN) of FACS.

In the last few years, he is especially active in promoting collaborations among FACS member societies. He organized the Cambodian Malaysian Chemical Congress (CMCC) in Seam Reap, Cambodia in 2012 and the Vietnam Malaysian Chemical Congress (VMCC) in Hanoi, Vietnam in 2014

### **International Union of Pure & Applied Chemistry (IUPAC)**

Datuk Dr Soon plays an active role in the International Union of Pure & Applied Chemistry (IUPAC) He played an active part in the International of Chemistry (IYC) 2011 where he served as a Member of the IUPAC IYC Management Committee and also in the Global Stamp Competition.

In 2011, IKM organised the IUPAC International Conference on Chemical Research Applied to World Needs (ChemRAWN XIX) in Kuala Lumpur, Malaysia in 2011 and also the 24th IUPAC International Conference in Chemistry Education (ICCE) in Kuching, Malaysia in 2016.

He served as a Titular Member of IUPAC ChemRAWN Committee from 2011 – 2018.

Datuk Dr Soon is a National Representative of the IUPAC Committee on Chemistry Education (CCE) since 2009 and serves as a Titular Member from 2018 until present. At CCE, he brought the Young Ambassadors of Chemistry (YAC) program to Malaysia in 2012 and is currently involved in the Flying Chemist Program (FCP) and YAC.

In 2019 at the IUPAC 50th General Assembly (50GA) in Paris, IKM won the bid to organise the IUPAC 53rd General Assembly (53GA) and 50th World Chemistry Congress (50WCC) in Kuala Lumpur, Malaysia in 2025. At the same function, IKM also won the right to organise the 50th IUPAC World Polymer Congress (MACRO 2026) in Kuching, Malaysia in 2026.

Datuk Dr Soon Ting-Kueh has been very active in promoting the advancement of chemistry in Malaysia and Asia. He serves in the IKM Council since 1988 and has held many positions in IKM Council, including Chairman of Chemical Education Section since 1988 and President from 2007 – 2014. During his tenure as the President, IKM organized many international conferences and meetings such as the 7th Asian Chemical Congress (7ACC) in 2007, the 10th Asian Conference on Analytical Sciences (ASIANALYSIS X) in 2009 and the International Symposium on Pure and Applied Chemistry (ISPAC) in Kuching, Malaysia in 2016.

In 2012, Dr Soon was conferred a **Honorary Doctorate** by the Kazan National Research Technological University, Republic of Tatarstan, Russia and in 2013, he was admitted as a **Honorary Fellow** of the Singapore National Institute of Chemistry. For his contribution to the advancement of chemistry in Asia and the Pacific, Datuk Dr Soon Ting Kueh is awarded the **FACS Citation Award 2015**.

Datuk Dr Soon continues to play an active role in the advancement of chemistry worldwide. He also plays an important role in promoting chemistry education and public appreciation of chemistry among the younger generation and the general public.



30<sup>th</sup> March 2021

Dear Executive Director of IUPAC,

The Chemical Society of Thailand (CST) is very pleased to nominate Professor Dr. Supawan Tantayanont to be a candidate for the IUPAC Vice President which will be elected during the General Assembly 2021.

During the past four decades, Professor Tantayanont has led efforts at several local, national, and international societies and organizations, in various kinds of tasks and activities which involved in IUPAC for over 13 years. These provide a solid foundation from which to launch new ideas, to build more effective collaborations within IUPAC, and to strengthen both existing and new relationships with other scientific organizations and stakeholders, to support the strategic plan of IUPAC.

Enclosed, please kindly see her statement on four vital matters, while maintain and enhance all the continued tasks and activities of IUPAC through Expanding and maintain membership in IUPAC, Engaging young generations to learn science, Fostering the sustainable development and Building the financial strength.

It is indeed the greatest pride of Thailand to nominate Professor Dr. Supawan Tantayanont as the IUPAC Vice President.

Enclosed, please kindly see the information of Professor Dr. Supawan Tantayanont as following:

1. A short statement describing their plans if elected.
2. Nomination letter
3. Abbreviated CV
4. Biographical sketch and photo

It would be very kind if you could consider this nomination and I am looking forward to hearing from you.

With the best regards,

Supa Hannongbua, Professor  
President of the Chemical Society of Thailand

## CV of SUPAWAN TANTAYANON

Birth: November 3, 1951, Rajchaburi, Thailand  
Marital Status Married, two sons.

### **Education**

1973 B.Sc. honor (Chemistry), Chulalongkorn University  
1975 M.Sc. (Organic Chemistry), Mahidol University  
1982 Ph.D. (Organic Chemistry), Worcester Polytechnic Institute, USA  
1993 Diploma (Polymer Science), Ferrara University, Italy

### **Academic Positions**

1975-1983 Instructor, Department of Chemistry, Faculty of Science, CU.  
1983-1990 Assistant Professor, Department of Chemistry, Faculty of Science, CU.  
1990-2012 Associate Professor, Department of Chemistry, Faculty of Science, CU.  
1997-2012 Affiliate Associate Professor, Worcester Polytechnic Institute, USA  
2009-2013 Adjunct Professor, University of Regina, Canada  
2012-present Professor, Department of Chemistry, Faculty of Science, CU.

### **Administrative Positions in Chulalongkorn University**

1985-1990 Director, Graduate Multidisciplinary Program on Petrochemical and Polymer Science and Technology, Graduate School.  
1986-1989 Founding Director, Petroleum and Petrochemical College.  
1997-2000 Vice Chair for Planning and Development, Department of Chemistry.  
2000-2003 Vice Chair for Research Affairs, Department of Chemistry.  
2003-2007 Associate Dean, Faculty of Science.  
2007-2012 Director, Technopreneurship and Innovation Management Program.

### **Positions Held (International)**

1999-2001 Vice President, Pacific Polymer Federation  
2002-2003 President, Pacific Polymer Federation  
2002-2006 Coordinator, ACS Green Chemistry Institute (Thailand Chapter).  
2003-present Member, the Editorial Board of Polymer International, John Wiley & Son.  
2006-2007 Co-director of Low-cost Instrumentation and Microscale Chemistry, FACS.  
2007-2009 Director of Low-cost Instrumentation and Microscale Chemistry, FACS.  
2009-2011 President-Elect, Federation of Asian Chemical Societies (FACS)  
2009-2012 Thailand Representative, IUPAC.  
2010-2013 Director, The Asian Regional Center of Chemical Safety and Security under the collaboration of Sandia National Laboratory, USA and Faculty of Science, Chulalongkorn University  
2011-2013 President, Federation of Asian Chemical Societies (FACS)  
2011-2018 Member, Asian Chemistry editorial Societies (ACES), Wiley  
2011-2013 Member, Committee on Chemical Nomenclature and Structure Representation Division, IUPAC  
2013-2015 Member, Committee on Chemistry and Environmental Division, IUPAC.  
2013-2015 Immediate Past President, Federation of Asian Chemical Societies (FACS)  
2013-present Member, Standing Committee on Chemical Education, IUPAC.  
2016-2019 Project Coordinator, Federation of Asian Chemical Societies (FACS)  
2017-present Member, IGCS, IUPAC  
2018-2020 Member, Advisory Board of UNIDO-Yale Global Green Chemistry Initiatives

**Positions Held (National)**

1990-2016	Member, Professor Dr Tab Nilanithi Foundation
1995-present	Member, Dr. Preecha and Prapi Amartayakul Foundation
1997-2003	President, Polymer Society (Thailand)
1998	Assistant General Secretary, National Foundation of Promoting of Science and Technology
1998-2001	President, Chemical Division, Science Society of Thailand.
2001-2006	Vice President, Chemical Society of Thailand
2002-present	Director, Small Scale Chemistry Center, Chulalongkorn University
2003-2017	Vice President, Science Society of Thailand.
2004-2014	Member, Distance Learning Foundation.
2007-2012	President, The Chemical Society of Thailand.
2007-2010	Member, the Safety Committee of National Synchrotron Light Research Institute (Public Organization)
2007-2012	Chairperson, The Chemistry Olympiads Sub-Committee, The Institute for the Promotion of Teaching Science and Technology
2010-2019	Member, the National Hazardous Chemical Committee, Thailand
2011-2013	Member, the Chemical and Consumer Laboratory Accreditation Committee, Thai Industrial Standards Institute, Thailand.
2013-2017	Member, Council of Science and Technology Professionals.
2013-2017	Chair, Sub- Committee of Science and Technology Professionals in Hazardous Chemical Manufacture, Control and Management, Council of Science and Technology Professionals.
2017-present	President, The Council of Science and Technology Professionals of Thailand
2017-present	Member, the Trade Secrets Board, Department of Intellectual Property, Ministry of Commerce.
2020-present	President, The Science Society of Thailand

**Honours, Awards and Scholars**

1977	Fulbright grantee
1979	Phi Lambda Upsilon, Beta Zeta Chapter, USA
1980	Sigma Xi, USA
2009	Outstanding Alumnus of Faculty of Science, Chulalongkorn University
2011	Women in Chemistry, John Wiley & Sons.
2012	Science Project for Excellence Award, The Senate, Kingdom of Thailand
2013	Honorary Fellow, Singapore National Institute for Chemistry (Worldwide contribution to chemistry)
2013	National Research Council of Thailand scholar
2014	Women Leaders of the Global Chemistry Enterprise, ACS.
2015	International Microscale Chemistry Award.
2015	FACS Fellow, Federation of Asian Chemical Societies.
2017	CST Award for Distinguished Contribution to Chemical Education 2016.
2017	FACS Award for Distinguished Contribution to Chemical Education 2017
2018	2018 IUPAC CCE Distinguished Contribution to Chemistry Education.
2021	2021 IUPAC Distinguished Women in Chemistry or Chemical Engineering.

## Statement by Supawan Tantayanon

### Vice President Candidate

I am truly humbled and greatly honored to be nominated as a candidate for a Vice-President of IUPAC.

The world today is changing more rapidly than ever before, so it is quite challenging how to move towards a world that is changing for the better future. IUPAC, as a global leader with arguably the most worldwide resource for chemistry, can provide the solutions for achieving the sustainability in this world.

For more than four decades, I have led efforts at several local, national, and international societies and organizations, in various kinds of tasks and activities. My wide range of such substantive experiences, together with my involvement in IUPAC for over 13 years, provide a solid foundation from which to launch new ideas, to build more effective collaborations within IUPAC, and to strengthen both existing and new relationships with other scientific organizations and stakeholders, to support the strategic plan of IUPAC.

If elected, I will focus on four vital matters, while maintain and enhance all the continued tasks and activities of IUPAC:

1. **Expand and maintain membership in IUPAC:** The strength of IUPAC is the cooperation among its members. IUPAC must reach out the non-member national chemical societies, particularly the small societies, and help advise the possible way for them to become the National Adhering Organizations. This will expand its members which will enable IUPAC to serve humankind by advancing chemistry more worldwide.
2. **Engage young generations to learn science:** IUPAC must engage and motivate the young generations at all levels to love science and stay in science for many years beyond their scholarly career. More number of fun and interesting educational programs, and the online educational activities, would be created to attract the students and nurture their attractions. IUPAC has been a strong advocate for chemistry education and public outreach, so IUPAC can address and resolve this matter. The power of young generations is required for the fulfilment of IUPAC mission.
3. **Foster the sustainable development:** IUPAC must move towards the sustainable development through chemical sciences, like green chemistry. By collaboration with other scientific organizations and stakeholders, IUPAC can play a crucial role to create valuable and exciting programs and initiatives in research, cooperation, network, education, and courses.
4. **Build the financial strength:** IUPAC must acquire enough budget to afford new projects, activities, and tasks. It is thus worth to seek for the partnership from the private sectors who are willing to financially support some certain projects. The fundraising program is another potential approach, particularly for supporting public activities.

Finally, I believe I have the passion, enthusiasm, experiences, and time for the important work ahead. I ask for your support and would be most honored to service as Vice-President of IUPAC.

## Supawan Tantayanon (Thailand)

Professor Supawan Tantayanon, the Former Presidents of Polymer Pacific Federation (2002-2003) and Federation of Asian Chemical Societies (2011-2013), was tasked with establishing the first college of Chulalongkorn University in 1987, on petrochemical industry which was new to Thailand at the time. She was later a consultant of some petrochemical companies (1989-2000) which made her realized the importance of chemical safety and the integration of chemistry, business, and society. It influenced her teaching and research interest so much that her focus shifted to “greener” and “application-driven” chemistry. She initiated and constructed three more new academic programs aimed at applied chemistry, the transformation of science and technology to innovation, and this year on “Green Chemistry and Sustainability”.

Professor Tantayanon is interested in small-scale chemistry since 2000, firstly to solve the problems on the high risk of chemical exposure to students in the laboratory. Later she invented the complete set of portable organic chemistry laboratory, “Small-Lab Kit”, holding four Thai patents. She is also the authors of the books “Organic Chemistry Laboratory Based on Chemical Safety and Pollution Minimization (in Thai)”, a chapter “Microscale Organic Experimentations Using Small-Lab Kit” in the book “Microscale Chemistry Experiments for All Ages”, and the book entitled “Small Scale Laboratory: Organic Chemistry at the University Level”, available on the UNESCO website since 2009. In addition, she is the co-author of the book “Chemical Laboratory Safety and Security: A Guide to Developing Standard Operating Procedures”, The National Academies Press, USA available since 2016.

She held numerous national and international positions, including the Coordinator of ACS Green Chemistry Institute (Thailand Chapter) (2002-2006), and the Advisory Board member of UNIDO-Yale Global Green Chemistry Initiatives (2018-2020). Currently she is the Presidents of the Council of Science and Technology Professionals of Thailand, the Science Society of Thailand under the Patronage of His Majesty the King.

Professor Tantayanon was the plenary speakers at 5 various international conferences, conducted more than 100 workshops on small-scale chemistry, green chemistry, and chemical safety in various countries. She has received several awards, including 2018 IUPAC CCE Distinguished Contribution to Chemistry Education and 2021 IUPAC Distinguished Women in Chemistry or Chemical Engineering.

Professor Tantayanon has been active in IUPAC for over 10 years, attending IUPAC GA and Council meetings since 2007, involving with several IUPAC Divisions as a national representative and currently served as a member of the Standing Committee on Chemistry Education and the Interdivisional Committee on Green Chemistry for Sustainable Development. She also actively involved in several IUPAC programs: IYC in 2011, YAC in 2014, and GWB since 2010. Furthermore, she served as the Chairs of MACRO2014 and the 8th ICGC in 2018, as well as members of the IUPAC Task Group of the project No. 2012-009-1-020, and currently the project No. 2020-010-2-020.

## Abbreviated CV of Russell Boyd

<b>Position</b>	Alexander McLeod Professor Emeritus, Dalhousie University
<b>Education</b>	B.Sc. (First-Class Honours in Chemistry), UBC, 1967 Ph.D., Theoretical Chemistry, McGill University, 1971 NRC Postdoctoral Fellow, University of Oxford, 1971-73 Killam Postdoctoral Fellow, University of British Columbia, 1973-75

### Honours and Awards

Lefevre Gold Medal and Scholarship for the Highest Standing in Honours Chemistry at UBC  
Society of Chemical Industry Merit Award, 1967  
Chemical Institute of Canada Book Prize, 1966  
1967 Science Scholarship of the National Research Council of Canada, 1967-71  
National Research Council of Canada Postdoctoral Fellowship, 1971-73  
Killam Postdoctoral Fellowship, 1973-75  
Fellow of The Chemical Institute of Canada, 1983  
1983 APICS/Fraser Medal  
1986 CNC-IUPAC Award  
Fellow of the World Association of Theoretical Chemists, 1986  
Dalhousie University Senior Killam Fellow, 1989-90  
Faculty of Science Killam Professor, 1997-02  
Alexander McLeod Professor of Chemistry, 2001-13  
Dalhousie Innovation Award, 2008  
Montreal Medal, The Chemical Institute of Canada, 2009  
Inaugural Honorary Lecturer of the Canadian Association of Theoretical Chemists, 2010  
Charles A. Coulson Lecture, University of Georgia, 2011  
Science Atlantic Hall of Fame, 2012  
Distinguished Service Award, Dalhousie University, 2013  
Alexander McLeod Professor Emeritus, 2013-

### Positions at Dalhousie University

Assistant Professor, Department of Chemistry, Dalhousie University, 1975-80  
Associate Professor, Department of Chemistry, Dalhousie University, 1980-85  
Professor, Department of Chemistry, Dalhousie University, 1985-2013  
Chair, Department of Chemistry, Dalhousie University, 1992-2005  
Associate Vice-President Research, Dalhousie University, 2006-11  
Acting Director, Institute for Research in Materials, Dalhousie University, 2008

### Selected Activities

First President of the Canadian Association of Theoretical Chemists, 1983-86  
Chair, 8<sup>th</sup> Canadian Symposium on Theoretical Chemistry, 1983  
Chair of the Education Committee, Atlantic Provinces Council on the Sciences, 1987-90  
Editor for Theoretical Chemistry, Canadian Journal of Chemistry, 1988-98  
Chair, CSC Division of Physical and Theoretical Chemistry, 1990-92  
Chair, NSERC Strategic Grant Selection Panel on New Directions, 1993-95  
Director of Accreditation, Canadian Society for Chemistry, 1996-99  
Selection Committee for NSERC Chairs for Women in Science and Engineering, 1997  
Executive Member, Atlantic Provinces Council on the Sciences, 1988-90

Member of Selection Committee, CNC-IUPAC Awards, 1991-94  
Member of the College of Reviewers, Canada Research Chairs Program, 2000-  
Member, NSERC Grant Selection Committee for Physical and Analytical Chemistry, 2001-04  
Scientific Board, World Association of Theoretical and Computational Chemists, 2002-  
Member, Long-Range Planning Panel for High-Performance Computing in Canada, 2002-05  
Member, NSERC Atlantic Advisory Board, 2006-10  
President, Canadian Society for Chemistry, 2007-08  
Leader of the Chemical Institute of Canada delegation to China, 2008  
Adjudication Committee, Canada-US Fulbright Program, 2008-11  
Selection Panel, S and T Centers, National Science Foundation of the USA, 2009  
Chair, 7<sup>th</sup> Canadian Computational Chemistry Conference, 2009  
Member, NSERC Chemistry Scholarships and Fellowships Committee, 2009-12  
Member, National Initiatives Committee, Compute Canada, 2010-2014  
Research Director, Atlantic Canada Computational Excellence Network, 2010-2014  
Member, Canadian National Committee of IUPAC, 2011-  
Chair, Chemical Institute of Canada, 2012-13  
Elected Member of the Bureau of IUPAC, 2013-2021  
Member of the IUPAC Project Committee, 2013-2021  
Member of the IUPAC Executive Committee, 2019-2021  
Member, Killam Selection Committee, Canada Council for the Arts, 2014-17

### **Supervision of Co-Workers**

Supervised more than 25 postdoctoral researchers, 25 completed PhD theses, 6 completed MSc theses and 22 completed BSc theses at Dalhousie University.

### **Invited Seminars, Special Lectures and Publications**

More than 150 presentations at universities in Canada, USA, Europe, Australia, Japan, etc.  
More than 160 conference presentations, including about 80 by invitation.

About 290 papers in leading international journals, including two in *Nature*, and twelve book chapters written by invitation. Co-edited with Chérif F. Matta *The Quantum Theory of Atoms in Molecules*, published by Wiley-VCH in 2007. One of 25 authors of *Concepts in Chemistry*, an innovative textbook specifically written for the first-year Chemistry classes at Dalhousie University. One of eight authors of *Engines of Discovery: The 21<sup>st</sup> Century Revolution (The Long-Range Plan for High Performance Computing in Canada, 2005)*.

### **Experience Relevant to the Position of Treasurer of IUPAC**

As Chair of the Department of Chemistry, Prof. Boyd oversaw a multimillion-dollar budget and a payroll of about 120 individuals. Day-to-day accounting was provided by clerical staff and the management of the accounts was handled by an administrative officer. He oversaw a tenfold increase in the endowment funds of the Department of Chemistry. He gained valuable experience with endowed funds while serving on the Dalhousie University Planned Giving Advisory Board.

He worked closely with the Chief Financial Officer of the Chemical Institute in Canada (CIC), a professional organization with 6,000 members, in several capacities: Chair of the Chemical Institute of Canada, President of the Canadian Society for Chemistry, Chair of the 99<sup>th</sup> Canadian Chemistry Conference and Exhibition, Chair of the Scientific Program of the 89<sup>th</sup> Canadian Chemistry Conference and Exhibition, Member of the Board of the CIC Chemical Education Fund.

## Biography of Russell Boyd

Russell Boyd is Alexander McLeod Professor Emeritus at Dalhousie University. He graduated in 1967 from the University of British Columbia with First-Class Honours in Chemistry and the Lefevre Gold Medal. Upon receiving his PhD in 1971 in Theoretical Chemistry from McGill University, he went to Oxford University as an NRC Postdoctoral Fellow with Charles Coulson at the Mathematical Institute. He returned to Canada as a Killam Postdoctoral Fellow in Chemistry at UBC from 1973 to 1975. He joined Dalhousie University in 1975 and rose through the ranks to become a Professor in 1985. He was named a Killam Professor in 1997 and in 2001 he became the seventh Alexander McLeod Professor of Chemistry. The McLeod Chair, one of the oldest named professorships in Canada, was created in 1884. His administrative roles at Dalhousie University include serving as Chair of the Department of Chemistry from 1992 to 2005 and Associate Vice-President of Research from 2006 to 2011.

He has published about 300 peer-reviewed papers and review chapters in computational and theoretical chemistry and co-edited in 2007 *The Quantum Theory of Atoms in Molecules*. He has supervised the research of 25 PhD students, more than 25 postdoctoral fellows and senior visitors, and a comparable number of undergraduate students. He is Editor-in-Chief of a forthcoming major reference work entitled *Comprehensive Computational Chemistry*.

Professor Boyd is a member of the Scientific Board of the World Association of Theoretical and Computational Chemists (WATOC) and Chair of the 12<sup>th</sup> Triennial Congress WATOC. His many professional activities include serving as Editor for Theoretical Chemistry of the Canadian Journal of Chemistry from 1988 to 1998, President of the Canadian Society for Chemistry for 2007-2008, and Chair of The Chemical Institute of Canada for 2012-2013. He was elected to the Bureau of the International Union of Pure and Applied Chemistry (IUPAC) in 2013, and he was elected to the Executive Committee of IUPAC in 2019.

He has served on five committees (two as Chair) of the Natural Sciences and Engineering Research Council of Canada and numerous national selection committees including the Steacie Prize for Natural Sciences, the Adjudication Committee of the Canada-Fulbright Program, the Canadian Science and Engineering Hall of Fame, the Killam Selection Committee of the Canada Council, and the NSF (USA) Science and Technology Centers Selection Panel.

He received the 2009 Montreal Medal of the Chemical Institute of Canada in recognition of his distinguished contributions to the profession of chemistry in Canada.

## **Resumé**

**Name:** Wolfram Koch  
**Date and Place of Birth:** 18 July 1959 in Darmstadt, Germany  
**Nationality:** German  
**Marital Status:** Married to Christina Heck-Koch, 2 daughters

### **Work Experience:**

since 2002	Executive Director & CEO at Gesellschaft Deutscher Chemiker (German Chemical Society, GDCh)
1998 – 2002	Senior management positions at GDCh
1992 – 1998	Professor of Theoretical Organic Chemistry at Technical University of Berlin
1988 – 1991	Senior Scientist at IBM Germany's Scientific Center in Heidelberg
1987 – 1988	IBM Postdoctoral Fellow at IBM Almaden Research Center, San Jose, CA., U.S.A.

### **Education:**

1986	Dr. rer. nat. at Institute of Organic Chemistry at TU Berlin with Helmut Schwarz.
1978 – 1984	Study of Chemistry at Technical Universities of Darmstadt and Berlin, Degree: Dipl.-Chem.

### **Awards:**

2019	Goldene Ehrennadel (badge of honor) of the German Association of Managers in the Chemical Industry (VAA)
2017	Honorary Membership of the Israel Chemical Society
2015	Honorary Fellow of Chemistry Europe
2008	Honorary Membership of the Czech Chemical Society
2003	Fellow of the Royal Society of Chemistry
2002	Gold Medal of the Slovak Chemical Society
1987 – 1988	IBM Postdoctoral Fellowship
1987	Schering-Award for best dissertation in chemistry
1986	End-of-study award of Fonds der Chemischen Industrie
1984 – 1985	PhD Fellowship of Fonds der Chemischen Industrie

### **Scientific Achievements:**

Author and co-author of some 190 papers in peer-reviewed journals, including ca. ten contributions to books (e.g., in *Encyclopedia of Computational Chemistry*).

Senior author of a textbook on density functional theory: W. Koch, M. C. Holthausen: "A Chemist's Guide to Density Functional Theory", Wiley-VCH, Weinheim. 1st Edition 02/2000, updated 2nd Edition 05/2001, reprinted 02/2002, 08/2003, 07/2004, 03/2007, and 03/2008). More than 5000 copies sold.

Co-editor of special issues of *International Journal of Mass Spectrometry* and of *Molecular Physics*.

**IUPAC Activities:**

2014 - 2021	Titular Member, Committee on Publications and Cheminformatics Data Standards (CPCDS)
2002 – 2020	Executive Director/Secretary General of Deutscher Zentrallausschuss für Chemie (German NAO to IUPAC)
2008 – 2015	Member of the Finance Committee
2009 – 2012	Member of the Management Committee for the International Year of Chemistry
2006	IUPAC Fellow

**Selected Other Activities:**

since 2021	Member of the Project DEAL Advisory Board
since 2012	Member of the Board of Trustees of the VAA Foundation
since 2010	Member of Wiley-VCH/GDCh Advisory Board
since 2003	Member of Council of Administration of the German Collecting Society (VG Wort)
since 2000	Member of the Executive Board of the European Chemical Society (EuChemS)
2016 – 2020	Member of the High-Level Advisory Group “Open Science Policy Platform” of the European Commission
2003 – 2020	Member of Scientific Advisory Board of German National Library of Science and Technology, since 2009 chairman
2002 – 2012	Member of Supervisory Board and of Owners Board of Chemistry Information Center Berlin (FIZ Chemie)
2003 – 2011	Member of Scientific Advisory Board of the North-German Supercomputing Alliance
2002 – 2008	Member of Scientific Advisory Board of Leibniz Institute for Information Infrastructure (FIZ Karlsruhe)

**Wolfram Koch** studied chemistry at the Technical Universities in Darmstadt and Berlin. He obtained his PhD in computational organic chemistry at TU Berlin in 1986. From 1987 until 1991 he worked for IBM, first as a Postdoc at the Almaden Research Center in San Jose, CA (USA), then as a Senior Scientist at IBM Germany's Scientific Center in Heidelberg (Germany). In 1992 Koch was appointed Professor of Theoretical Organic Chemistry at TU Berlin. In November 1998 he joined the Gesellschaft Deutscher Chemiker (GDCh, German Chemical Society) in Frankfurt. Since November 2002 he is GDCh's Executive Director.

Wolfram Koch authored and co-authored some 190 papers in peer reviewed journals and a textbook on density functional theory. He is a member of several advisory and governing boards including the Executive Board of the European Chemical Society (EuChemS), the Administrative Council of the Verwertungsgesellschaft Wort (German Copyright Collective) and the Open Science Policy Platform of the European Commission. For many years he chaired the Scientific Advisory Board of the German National Library of Science and Technology. Wolfram Koch is a Fellow of the Royal Society of Chemistry and an IUPAC Fellow and holds honorary memberships of the Czech and Israel Chemical Societies as well as an Honorary Fellowship of Chemistry Europe, the organization of 16 European chemical societies which publishes almost 20 scientific journals. In 2019 he received the "Goldene Ehrennadel" (badge of honor) of the VAA, the German association of managers in the chemical industry.

His activities within IUPAC include being a member of the Management Team for the International Year of Chemistry, serving two terms on the Finance Committee (2008-2015) and the Committee on Publications and Cheminformatics Data Standards (2014-2021). In addition he was Executive Director and General Secretary of the German NAO to IUPAC from 2002 until the end of last year.

## Statement on Background in Financial Matters

For almost 20 years I am the Executive Director of the German Chemical Society (GDCh). In this capacity I am also ultimately responsible for the budget and other financial decisions of the society. That includes the budget of the GDCh and in particular its investments. The GDCh relies to a significant part on the performance of its investment portfolio of more than 90 M USD at the Financial Markets. The day-to-day work including many strategic decisions is prepared and managed by the GDCh Finance Director and his team who has already agreed to support me in all financial IUPAC matters.

Since I served on the IUPAC Finance Committee for two full terms (2008-2015) I do of course know about the internal role of the Finance Committee and the external audit process. I am familiar with the latter also due to my GDCh experience since we are audited externally as well (currently KPMG). My time on the Finance Committee also allowed me to get first-hand insight into IUPAC's financial situation including the challenges the Union is facing.

Based on this prior experience I am confident to fulfill the requirements for Treasurer of the Union.

Wolfram Koch, May 20, 2021



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**31/March /2021**

Dear IUPAC Nomination Committee

**Subject:** letter of support to nominate Professor Abeer Al-Bawab as member of IUPAC Bureau for term of 2022-2023.

It is with distinct professional and personal pleasure that I write this letter as a notice of nomination for Prof Abeer Al Bawab for the IUPAC elections for the 2022-2023 term as a member of the Bureau.

As a Prof. in chemistry Dr. Al-Bawab is an outstanding colleague in the field of Chemistry research in Jordan. She completed her undergraduate and master's degrees at the University of Jordan, and then pursued her PhD at Clarkson University in the United States of America. During her career, she dedicated her efforts, time, and knowledge to enhance the local scene of academic education and research. During the first ten years upon earning her titles as an assistant and associate professor, from 1998 to 2007, she served solely in academic teaching and researching, then gained her Prof title early. Following that, and as she profoundly proved her name and expertise through her hard work, she began getting appointed in high positions in relating to running research centers and institutions in Jordan. Not only has she honed her quantitative, critical thinking, and interpersonal skills through academic experiences, but she also exemplified the highest levels of leadership during her roles in management. Dr. Al-Bawab spent 20 years at the



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University of Jordan as a Professor. During that time as a faculty member, she was very actively involved in research, particularly one with a specific focus on an interdisciplinary approach. As a result, she has author or co-authored approximately 80 peer-reviewed publications in high standard international journals and conferences, most of which tackle a very specific emerging field of research and its applications in the real world. Those published papers are the result of 30 nationally and internationally funded projects, for approximately \$4,150,000 secured over the past fifteen years.

Additionally, she served as a mentor for undergraduate and graduate students, supervised more than 20 PhD and/or master's students, and found her own laboratory housed at the University of Jordan, focusing on chemistry and nanoparticle research. Simultaneous to her role as a faculty member at the University of Jordan, she has served as the director of Hamdi Mango Research Center for 6 years, dean of the Academically Research Deanship for 2 years, as well as General Director at the research support fund at the Minister of Higher Education and Scientific Research. During her time in leadership roles, she took initiative to construct some major research groups, including the Nanotechnology Research Group and the very first Management of Solid Waste Research group, both at the University of Jordan.

In addition to her academic roles at the University and the ministry, she ensured her involvement in the **social aspects** of the community to her capacity. She has always believed in the notion that academic research extends beyond the aspect



of the laboratory and manuscript writing, and to ensure using her position as a female researcher in Jordan to be involved within the academic community. She has traveled to more than **40** countries for chairing, lecturing, attending, or moderating for various conferences or workshops. Often, she was the delegate representing Jordan in the given field. In addition, she served as a moderator or participant in many trainings and workshops in Jordan that focus on educating the youth on the basics of research and manuscript writing. Furthermore, Al Bawab served as a member then chairperson of Jordanian **HEREs** (Higher Education Reform Experts), & former member of the Board of Trustees for (PSUT).

Most recently, Dr. Al-Bawab received **the IUPAC award for Distinguished Women in Chemistry**. Undoubtedly, this was a well-earned recognition that we in the scientific community were not surprised with. However, what was amusing to witness is that Dr. Al-Bawab utilized her recognition locally in the media to further inspire the Jordanian youth. With every achievement she stumbles upon, she uses it as a platform to inspire the younger generation and promote the love of chemistry in a context that needs it. Such actions reiterate Al-Bawab's perception of chemistry, science, and research as a heartfelt passion. In a world where Science continuously proves its necessity for human survival, we need more people like Al-Bawab to inspire others.

Al Bawab was very active member in the Jordanian Chemical Society (JCS) since she was a student, then she became president of for two terms, and now is acting in the consulting committee for JSC, during all her roles she was interested in



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the **IUPAC impact** in the world and making sure that Jordan stays active member in the Union (these roles are voluntary). She is a very active member in many locally or international societies and unions, for example, Association of Jordanian Women Academics, Arab Union for Chemists and American Chemical Society ACS, **she was the founder of the ACS Chapter in Jordan**. She can maintain a high level of activity in any Union or society once she is really involved.

I can confidently say that I have no doubt Al-Bawab is very interested in this position at the IUPAC, and if granted, will use her position to inspire others and advance the world of Chemistry and will maintain a high level of activity in the Union like she did in other positions.

**For all those reasons, I and the Jordanian Chemical Society members (JCS), give her our sincerest recommendations and highest references. Please do not hesitate to contact me for further information or questions.**

Respectfully,

Prof. Dr. Raed Ghanem

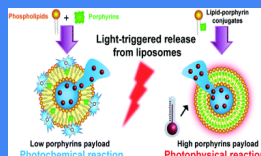
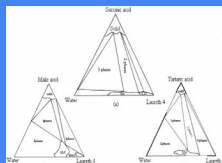
President of Jordanian Chemical Society



# Prof. Dr. Abeer Al Bawab



Al Bawab is a professor at the University of Jordan specializing in the field of applied Physical Chemistry. She has extensive experience in academic research, teaching & management. Her research publications continue to make an impact within the academic scheme & the local community



+962 79 6661601

[drabeer@ju.edu.jo](mailto:drabeer@ju.edu.jo)

[orcid.org/0000-0003-2131-1791](https://orcid.org/0000-0003-2131-1791)

## Education:

BSc in chemistry - The university of Jordan (UJ) (1991)

MSc and PhD in chemistry - Clarkson University (CU) – New York, USA (1993- 1997)

## Work Experience:

Prof. in UJ (1998-present)

*Researcher and Manager for scientific & social projects (national and international)*

*General Director of Scientific Research Support Fund / the Ministry of Higher Education and Scientific Research (2017-2018).*

*Dean for the Deanship of Academic Research in UJ (2014-2016).*

*Director for a research center ;Hamdi Mango Center for Scientific Research (HMCSR) (2008 – 2014) in UJ.*

*President of the Jordanian Chemical Society (JCS) (2013-2018).*

*Vice President for Association of Jordanian Women Academics (2014-2018).*

*The chairperson & member for HEREs committee (Higher Education Reform Experts) appointed by European Commission in Brussels (2014-2021).*

*A member of the Board of Trustees of Princess Sumaya University for Technology (PSUT), Jordan (2014-2017).*

## Scientific Research:

She is authored and co-authored **more than 80** accredited and impacted scientific papers, which were published on international journals. Her main interest is in applied Physical & Surface Chemistry, as well as Nanoscience oriented towards, environment, water, food and **conservation of Culture Heritage** sites, as well as **education & research management & enhancement**.

## Research Projects & Community Partnership Initiatives

Dr. Al bawab is a coordinator or member of many initiations & funded projects such as; MIMr; (Erasmus<sup>+</sup>), JOCHERA, WatereUSE [all from EC], **Restoration & Rehabilitation Project** of the **Roman Nymphaeum** in Amman, phase I & II (AFCP (Ambassador Fund for Culture Preservation) from the American Embassy), **Dead Sea Pre-Final Product and Modification** from Potsh, JO, **Economical Separation of Soluble Phenolic Compounds** from OMW (From MENA NWC's water Innovation Fellowships (WIF) **USA aids**).

She is involved in many social projects such as: Empowerment of Jordanian Women academics, reality, achievement, requirements & challenges (MEPI, ACOR, USA). Recycling & Management Solid Waste inside the campus towards Green Campus, Animal house Research Building Establishing, DAR, UJ.

## Awards:

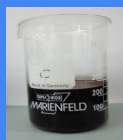
✓ **IUPAC distinguished women in chemistry ,2021**

✓ Changer Creators (Arabic Women power for change) 2019

✓ Woman in Science Hall of Fame (2014), the American Embassy in Jordan,

✓ Arab Woman Award in Science and Technology for Development (2011), the Arab Women Organization

✓ Distinguished Researcher Award (2011) granted by UJ



**Prof Abeer Favez Al Bawab**  
**School of Science/ The University of Jordan/ Professor of Applied Physical**  
**Chemistry**

**orcid.org/0000-0003-2131-1791/ Scopus id 0000-0003-2131-1791**

Abeer F. Al-Bawab is a professor of Applied Physical Chemistry in The University of Jordan (UJ). She obtained her B.S degree in chemistry in **1991** from The University of Jordan. Successive, the PhD and master's degree in physical chemistry were obtained from Clarkson University (CU) – New York, USA, during the period of **1993 - 1997**.

Previously, she was the General Director of Scientific Research Support Fund / the Ministry of Higher Education and Scientific Research (2017-2018). Currently she works as a professor teaching chemistry courses as well as conducting research and managing scientific projects (national and international) in the University of Jordan (UJ) (1998-present). She acts as a mentor for her students in life and science, having supervised several graduate students previously and currently. Her main research interests are tremendously revealed in Applied Physical & Surface Chemistry, as well as Nanoscience oriented towards, environment, water, food and conservation of Culture Heritage sites or problems as well as education & research management & enhancement.

Previously she was the dean for the **Deanship of Academic Research (DAR)** from 2014 to 2016. Preceding 2014, she worked as a director for a research center located at the heart of The University of Jordan, **Hamdi Mango Center for Scientific Research (HMCSR)**, for **six** continues years (2008 – 2014). During that time, Prof. Al-Bawab had set her eyes toward achieving her mission of restructuring the Center & Deanship and relocating its objectives and responsibilities. Consequently, she took the initiative to bring many ideas into action by obtaining many grants and funds for multiple research projects and capacity building projects. Additionally, she ensured to recruit many researchers as well as graduate, undergraduate and high school students to the center. What's more, the building capacity was enlarged for employees and students by construction workshops for their training. Nevertheless, she was involved in regulating the usage of scientific instruments, as well as establishment the center labs and transferring technology office inside the center then transfer these ideas and trying to put them in action into the deanship. Finally, she supervised the establishment of a whole building for animal research labs in the campus.

During her mission as dean & director, many funds & mega projects were initiated and are still in progressing such as **Recycling and Management Solid Waste** inside the campus towards **Green Campus**, **Animal Research Group & Projects** towards establishing a separate section and building, **Nanotechnology Group & projects** towards establishing separate section & labs.

Adding up to that, as a researcher she was and still is involved in many research projects that are funded institutionally, governmentally and internationally such as; (MIMr; Modernization Institutional Management of Innovation and Research in South Neighboring Countries,( Erasmus <sup>+</sup>)) JOCHERA, WatereUSE [all from EC], **Restoration**

& **Rehabilitation Project** of the **Roman Nymphaeum** in Amman, phase I & II (AFCP (Ambassador Fund for Culture Preservation) from the American Embassy), **Dead Sea Pre Final Product and Modification**, (from the Arab Potash Company), **Economical Separation of Soluble Phenolic Compounds from OMW** (From **MENA NWC's** water Innovation Fellowships (WIF) **USA aids**). In addition, she is involved in many social projects such as: Empowerment of Jordanian Women academics, reality, achievement, requirements, and challenges (MEPI, ACOR, USA). All these projects had a total funding worth more than **\$3.0 million**.

Furthermore, Prof. Al-Bawab authored and co-authored **around 80** different scientific papers, which were published on international journals. Some of them are original and novel scientific or research management, papers, reviews, chapters, and books. Concurrently, she was invited and attended many international and national conferences, meetings, workshops, and symposiums that were focused on scientific **or/and** research management purposes. Also, she was involved in establishing & arranging some national & international conference, meetings, workshops, and symposiums. Some of them she was Chair, Cochair, Moderator or Facilitator.

Moreover, Prof. Al-Bawab received many different honor awards such as **IUPAC distinguished women in chemistry 2021**, **Changer Creators (Arabic Women power for change) 2019**, the Woman in Science Hall of Fame (2014) granted by the American Embassy in Jordan, the Arab Woman Award in Science and Technology for Development (2011) in the League of Arab States granted by the Arab Women Organization as well as the Distinguished Researcher Award (2011) granted by The University of Jordan.

Additionally, Prof. Al-Bawab was the **editor-in-chief** for Dirasat Journal, which is published by the University of Jordan in Amman, Jordan, from 2014 to 2016. She is also a member in the **editorial board** for; **JJC** (Jordan Journal of Chemistry, published by Al-Yarmouk University in Irbid, Jordan), **Universal Journal of Chemistry** (published by Horizon Research Publishing in the United States of America) as well as the American Journal of Applied Chemistry (Published by Science PG in New York). She is scientific and proposals evaluator for many research agencies such as EC (European commission, FP7 & H20/20 proposals), Abdul Hameed Shoman Fund for Supporting Scientific Research, The Scientific Research Support Fund (**SRSF**). Also, evaluator for many scientific international journals and institutional scientific promotion.

Additionally, she often speaks at international events. She was able to travel to more than 40 countries for chairing, lecturing, attending, or moderating for congress, conference, symposium, meeting or workshop through funded projects or scientific networking or invitations.

In addition, Prof. Al-Bawab was the **President** of the Jordanian Chemical Society (**JCS**) (2013-2018) and was **vice President** for Association of Jordanian Women Academics (2014-2018). Now she is the chairperson for **HEREs** committee (**Higher Education Reform Experts**) appointed by the Education, Audiovisual, and Culture Executive Agency at the European Commission in **Brussels** (2018-2021), after serving as a member in this committee during (2014-2018), Finally, she was a member of the Board of Trustees of **Princess Sumaya University for Technology (PSUT)** in Amman, Jordan (2014-2017).

Dr Lynn Soby  
Executive Director  
International Union of Pure and Applied Chemistry (IUPAC)  
P.O. Box 13757  
Research Triangle Park  
North Carolina, USA  
27709

31 March 2021

Dear Lynn

I am writing to confirm that the Royal Society of Chemistry, as the UK National Adhering Organisation of IUPAC, wishes to nominate Professor Hemda Garelick for a second term on the IUPAC Bureau.

I attach Hemda's CV, biography and photograph. Do not hesitate to contact me if you require further information.

Yours sincerely



Dr Sarah Thomas CSci CChem FRSC  
Senior Programme Manager, International Engagement

Hemda Garelick is a Professor of Environmental Science and Public Health Education, Department of Natural Sciences, School of Science and Technology, Middlesex University. She is currently the President of 'Chemistry and the Environment' Division at the International Union of Pure and Applied Chemistry (IUPAC). [https://iupac.org/who-we-are/divisions/division-details/?body\\_code=600](https://iupac.org/who-we-are/divisions/division-details/?body_code=600)

Prof Garelick has a long term interest in public and environmental health, with particular focuses on health and hygiene aspects of water, wastewater and sanitation systems, investigating health aspects of chemical and microbial pollution in water and soil. Areas of particular interest include: the analysis and the fate of antibiotics and antibiotic resistant microorganisms in the environment and in food, which led to a number of local and pan European projects, as well as the impact of solid waste disposal such as electronic waste (E-Waste) and its effect. Her interest in pollution affecting poor societies has also led her to investigate the problem of arsenic pollution in drinking water and the effect of people exposure to contaminated groundwater. Similarly, she became interested in the informal recycling of electronic waste (E-Waste) and its effect on the health and environment of poor societies such as the Nigerian sites near the city of Lagos.

She has been working on EU funded projects related to dissemination in countries such as Kazakhstan and Russia and developed long term relationships with scientist in these countries which led to joint IUPAC projects.

As well as the research carried out at Middlesex University a number of IUPAC projects related to the above have been developed and carried out.

Over the years she has also been involved in many IUPAC activities and has built cross- and inter-divisional and committee collaborations as well as Union led activities such as WCLM (World Chemistry Leadership Meeting supporting the NAO programme for Young Observers) and GWB (Global Women Breakfast, on the Union activities to enhance diversity and connection).



## HEMDA GARELICK (PROFESSOR OF ENVIRONMENTAL SCIENCE AND PUBLIC HEALTH EDUCATION)

Department of Natural Sciences, Faculty of Science & Technology, Middlesex University

[h.garelick@mdx.ac.uk](mailto:h.garelick@mdx.ac.uk);

ORCID: <https://orcid.org/0000-0003-4568-2300>

### Education

- PhD, London University,. Thesis titled 'Studies on the growth and attenuation of hepatitis A virus in cell culture'. Developed a vaccine for Hep A as part of the project.
- MSc (with distinction), School of Applied Science, Hebrew University, Jerusalem, Israel, in Human Environmental Studies.
  - BSc (Hons), Chemistry. Technion, Israel Institute of Technology, Haifa, Israel.

### Membership of Professional Bodies & Learned Societies

- Fellow of the Royal Society of Chemistry
- Member of The American Chemical Society
- Fellow the Higher Education Academy
- Member of the London Freshwater Group

### IUPAC Engagement

- President of the Chemistry and the Environment Division of the International Union of Pure and Applied Chemistry (IUPAC) 2020- to date
- Elected member of the Bureau IUPAC: 2016-2020
- Member of the UK delegation to the IUPAC council:2010- to date
- Division representative on the Committee on Chemistry Education (CCE) a Committee on Chemistry and Industry (COCI) for different periods 2010-2018
- Chair of the Subcommittee on Chemistry of Environmental Compartments Division of Chemistry and the Environment. IUPAC: 2008-2014
- Secretary of the Chemistry and the Environment Division of the International Union of Pure and Applied Chemistry (IUPAC) 2014-2018
- Participation in IUPAC project
  - Current projects: 12
  - Completed projects: 14

### Other Academic Activities

- Associate editor: Frontiers in Microbiology, section Antimicrobials, Resistance and Chemotherapy 2019- A member of the of the editorial board of *Work Based Learning e-Journal* ISSN 2044-7868  
<http://wblearning-ejournal.com>
- Invited referee : The Portuguese Foundation for Science and Technology (FCT) : 2013-2014
- A Panel Member for the Research Council of Norway. 2009-2012
- Panel: *Responsive Mode Projects in Environment and Development (FRIMUF)*

### Research supervision, Teaching and Assessment

- Completions: (11 PhD, 2MProf, 15 DProf); Current supervision: (6 PhD, 8 DProf)
- Examination : (8 at Doctoral level, numerous at Master level, Numerous panel Charing)
- Leader of Specialist Pathway in Masters and Doctorates in Professional Studies (M/DProf) In the Schools of Science and Technology and Health and Education, Middlesex University
- Departmental Research Degree Coordinator
- Leader, MSC module 'Monitoring and Control of Pollution'; Supervised to completion over 80 MSc projects

## Selected Publications Relevant to IUPAC Work

Over 100 outputs including publications and conference presentations, edited books and book chapters

- Victor Castro Gutierrez, Francis Hassard, Rodrigo Leitao, Beata Burczynska, \_View  
Dirk Wildeboer, Isobel Stanton, Shadi Rahimzadeh, Gianluca Baio, **Hemda Garelick**... Lian Lundy, Andrew C Singer, Mariachiara Di Cesare (2021) Monitoring occurrence of SARS-CoV-2 in school populations: a wastewater-based approach. doi: <https://doi.org/10.1101/2021.03.25.21254231>
- Marano, Roberto B M, Fernandes, Telma, Manaia, Célia M, Nunes, Olga, Morrison, Donald, Berendonk, Thomas U, Kreuzinger, Norbert,.... Bürgmann, Helmut, Beck, Karin, **Garelick, Hemda** , .....and Cytryn, Eddie (85 contributors) (2020) *A global multinational survey of cefotaxime-resistant coliforms in urban wastewater treatment plants*. Environment International, 144 , 106035. ISSN 0160-4120 [Article] (Published online first) (doi:[10.1016/j.envint.2020.106035](https://doi.org/10.1016/j.envint.2020.106035))
- Purchase, Diane , Abbasi, Golnoush, Bisschop, Lieselot, Chatterjee, Debashish, Ekberg, Christian, Ermolin, Mikhail, Fedotov, Petr, **Garelick, Hemda** , Isimekhai, Khadijah, Kandile, Nadia G., Lundstrom, Mari, Matharu, Avatar, Miller, Bradley W., Pineda, Antonio, Popoola, Oluseun E., Retegan, Teodora, Ruedel, Heniz, Serpe, Angela, Shevah, Yehuda, Surati, Kiran R., Walsh, Fiona, Wilson, Benjamin P. and Wong, Ming Hung (2020) *Global occurrence, chemical properties, and ecological impacts of e-wastes (IUPAC technical report)*. *Pure and Applied Chemistry*, 92 (11) . pp. 1733-1767. ISSN 0033-4545 [Article] (doi:[10.1515/pac-2019-0502](https://doi.org/10.1515/pac-2019-0502))
- Cacace, Damiano, Fatta-Kassinos, Despo, Manaia, Celia M., Cytryn, Eddie, Kreuzinger, Norbert, Rizzo, Luigi, Karaolia, Popi, Schwartz, Thomas, Alexander, Johannes, Merlin, Christophe, **Garelick, Hemda** , et al (2019) Antibiotic resistance genes in treated wastewater and in the receiving water bodies: a pan-European survey of urban settings. *Water Research*, 162 . pp. 320-330. ISSN 1879-2448 (doi:[10.1016/j.watres.2019.06.039](https://doi.org/10.1016/j.watres.2019.06.039))
- Plume, Ruth, Page, Alan and **Garelick, Hemda** (2018) Responding to the risk of reducing resources: development of a framework for future change programmes in environmental health services. *International Journal of Disaster Risk Reduction*, 31 . pp. 30-36. ISSN 2212-4209 (doi:[10.1016/j.ijdrr.2018.04.013](https://doi.org/10.1016/j.ijdrr.2018.04.013))
- Pantoja Munoz, Leonardo, Gonzalez Baez, Alejandra, McKinney, Deena and **Garelick, Hemda** (2018) Characterisation of “flushable” and “non-flushable” commercial wet wipes using microRaman, FTIR spectroscopy and fluorescence microscopy: to flush or not to flush. *Environmental Science and Pollution Research*, 25 (20). pp. 20268-20279. ISSN 0944-1344 (doi:[10.1007/s11356-018-2400-9](https://doi.org/10.1007/s11356-018-2400-9))
- Chan, Wai Kit, Wildeboer, Dirk, **Garelick, Hemda** and Purchase, Diane (2018) Competition of As and other Group 15 elements for surface binding sites of an extremophilic *Acidomyces acidophilus* isolated from a historical tin mining site. *Extremophiles*, 22 (5). pp. 795-809. ISSN 1431-0651 (doi:[10.1007/s00792-018-1039-2](https://doi.org/10.1007/s00792-018-1039-2))
- Isimekhai, Khadijah, **Garelick, Hemda** , Watt, John and Purchase, Diane (2017) Heavy metals distribution and risk assessment in soil from an informal e-waste recycling site in Lagos State, Nigeria. *Environmental Science and Pollution Research*, 24 (20) . pp. 17206-17219. ISSN 0944-1344 [Article] (doi:[10.1007/s11356-017-8877-9](https://doi.org/10.1007/s11356-017-8877-9))
- Ellis, John Bryan and **Garelick, Hemda** (2009) A multi-criteria approach for assessing options to remediate arsenic in drinking water. In: *Reviews of environmental contamination: international perspectives on arsenic pollution and remediation*. **Garelick, Hemda** and Jones, Huw , eds. *Reviews of Environmental Contamination and Toxicology*, 197 . Springer, New York, pp. 129-161. ISBN 9780387792835. [Book Section] (doi:[10.1007/978-0-387-79284-2\\_5](https://doi.org/10.1007/978-0-387-79284-2_5))
- **Garelick, Hemda** , Jones, Huw , Dybowska, Agnieszka and Valsami-Jones, Eugenia (2008) Arsenic pollution sources. In: *Reviews of environmental contamination: international perspectives on arsenic pollution and remediation*. **Garelick, Hemda** and Jones, Huw , eds. *Reviews of Environmental Contamination and Toxicology*. (197) . Springer, New York. ISBN 9780387792835. [Book Section] (doi:[10.1007/978-0-387-79284-2\\_2](https://doi.org/10.1007/978-0-387-79284-2_2))
- **Garelick, Hemda** and Jones, Huw (2008) Mitigating arsenic pollution: bridging the gap between knowledge and practice. *Chemistry International*, 30 (4) . ISSN 0193-6484 [Article]

## Selected conference presentations

- **Hemda Garelick**, Khadijah Isimekhai, Alejandra Gonzalez Baez, Leonardo Pantoja-Munoz and Diane Purchase (2020). *E-Waste : What Is It ? Where Is It and Who Is Effected?*. *IUPAC Keynote Lecture* at the International Scientific Conference. "Physics and Radioelectronics in Medicine and Ecology Phreme'2020" Vladimir Russia, 2-3/07/2020
- L. Pantoja Munoz\*, A. Gonzalez Baez, D. Mckinney, H. Garelick\* (2019) Microplastics and Wet-Wipes: Should They Be Flushed into The Sewer System. *IUPAC 47th World Chemistry Congress* (in Paris 5-12 July, 2019 Theme: Chemistry and Society : Current Knowledge
- D. Purchase\*, G. Abbasi, L. Bisschop, D. Chatterjee, C. Ekberg, P. Fedotov, **H. Garelick**, N. Kandile, M. Lundström, A. Matharu, B. Miller, A. Pineda, O. Popoola, T. Retegan , H. Ruedel, A. Serpe, Y. Sheva, K. Surati, F. Walsh, B.P. Wilson, M.H. Wong (2019) E-Waste - An Emerging 21st Century Global Grand Challenge: Global Occurrence, Chemical Properties and Ecological Impacts. *IUPAC 47th World Chemistry Congress* (in Paris 5-12 July, 2019 Theme: Chemistry and Society : Current Knowledge



# INSTITUT KIMIA MALAYSIA

MALAYSIAN INSTITUTE OF CHEMISTRY

(Inaugurated on 8 April 1967, incorporated under Chemists Act 1975 on 1 November 1977)

127B, JALAN AMINUDDIN BAKI, TAMAN TUN DR ISMAIL, 60000 KUALA LUMPUR

TEL: 603-7728 3272 FAX: 603-7728 9909

EMAIL: [ikmhq@ikm.org.my](mailto:ikmhq@ikm.org.my)

WEBSITE: <http://www.ikm.org.my>

FACEBOOK: Institut Kimia Malaysia

President: Datuk ChM Dr. Soon Ting Kueh

15 March 2021

**Dr. Lynn M. Soby**

Executive Director, IUPAC

IUPAC Secretariat

PO BOX 13757

Research Triangle Park,

NC 27709-3757, USA

## Institut Kimia Malaysia Nomination - Datuk Dr SOON Ting Kueh

On behalf of Institut Kimia Malaysia (IKM) Council, we would like to nominate **Datuk Dr SOON Ting Kueh**, IKM President, to stand for election as a IUPAC Bureau member as well as Vice President.

Thank you.

Yours sincerely,

.....  
**Datin Dr Zuriati Zakaria**

IKM Vice President



## BIOGRAPHICAL SKETCH

Name: **SOON Ting-Kueh (Ph. D.)**

**Datuk Dr Soon Ting-Kueh** is President of Institut Kimia Malaysia (IKM) since 2018 and currently a Titular Member in the IUPAC CCE.

### Education, Academic Career and Research

Dr Soon graduated from University of Malaya with B. Sc. Hons (Chemistry) in 1972 and obtained his Ph. D. from the same university in 1975. His areas of research and work include physical organic chemistry, oils and fats chemistry and technology, oleochemicals and biofuels, and chemistry education.

### Institut Kimia Malaysia (IKM)

Datuk Dr Soon is IKM President and he is actively involved in advancing chemical sciences and chemistry education. He is the Chairman of IKM Chemical Education and Community Section Committee since 1988 and serves in a number of Academic Advisory Boards of Malaysian universities. He is also a member of the National Council on the Teaching of Mathematics and Science under the Ministry of Education Malaysia. For his contribution to chemistry education, IKM presented him with the **Tan Sri Dato' Seri Law Hieng Ding Award** in 2010.

### Organisation for the Prohibition of Chemical Weapons

Datuk Dr Soon also served as a member of the Temporary Working Group on Education and Outreach in the Organisation for the Prohibition of Chemical Weapons (OPCW) from 2012 – 13.

### Federation of Asian Chemical Societies (FACS)

Dr Soon is also very active in the Federation of Asian Chemical Societies (FACS), being its President (2007 – 2009) and serves in various positions in FACS Council until present.

### International Union of Pure & Applied Chemistry (IUPAC)

Datuk Dr Soon plays an active role in IUPAC. He is actively involved in the International Year of Chemistry (IYC) 2011 as a Member of the IUPAC IYC Management Committee. He is also a Titular Member in CCE from 2018.

At the IUPAC 50GA in Paris in 2019, IKM won the bid to organise the IUPAC 53rd General Assembly and 50th World Chemistry Congress in Kuala Lumpur, Malaysia in 2025 and also the right to organise the 51st IUPAC World Polymer Congress (MACRO) in Kuching, Malaysia in 2026.

Datuk Dr Soon has been very active in promoting the advancement of chemistry in Malaysia and Asia. IKM organizes many international conferences such as the 7th Asian Chemical Congress (7ACC) in 2007 and the annual International Congress on Pure and Applied Chemistry (ICPAC) since 2016.

In 2012, Dr Soon was conferred a **Honorary Doctorate** by the Kazan National Research Technological University, Republic of Tatarstan, Russia and in 2013, he was admitted as a **Honorary Fellow** of the Singapore National Institute of Chemistry. For his contribution to the advancement of chemistry in Asia and the Pacific, Datuk Dr Soon is awarded the **FACS Citation Award** in 2015.



## CURRICULUM VITAL

Name: **SOON Ting-Kueh (Ph. D.)**

Affiliation: Institut Kimia Malaysia (IKM)

**Datuk Dr Soon Ting-Kueh** is the President of Institut Kimia Malaysia (IKM) since 2018, He is the Past President of the Federation of Asian Chemical Societies (FACS) from 2007 – 2009 and has served in FACS Executive Committee in various capacities since 2005.

He is currently a Titular Member in the IUPAC Committee on Chemistry Education (CCE). He served as a Titular Member of the IUPAC Committee on Chemical Research Applied to World Needs (CHEMRAWN) from 2011 – 2018.

### Education, Academic Career and Research

Dr Soon graduated from University of Malaya with B. Sc. Hons (Chemistry) in 1972 and obtained his Ph. D. majoring in physical organic chemistry from the same university in 1975. His areas of research and work include physical organic chemistry, atmospheric chemistry, oils and fats chemistry and technology, oleochemicals and biofuels, and chemistry education.

### Involvement in IKM, FACS, IUPAC and OPCW

#### Institut Kimia Malaysia (IKM)

Datuk Dr Soon has been playing a very active role in Institut Kimia Malaysia (IKM) since he first joined the IKM Council in 1988. He became IKM President from 2007 and served until 2014. In 2018, he returned as IKM President and served until present.

He is actively involved in chemistry education both within and outside Malaysia. He is the Chairman of **IKM Chemical Education and Community Section Committee** since 1988. Under his chairmanship, the Section publishes 21 volumes of **Kimia Kini** which is distributed free to all secondary schools in Malaysia. The Section also organised many activities in chemical education and public appreciation and understanding of chemistry including the following:

- **Kuiz Kimia Kebangsaan Malaysia**” or **K<sub>3</sub>M** which is an annual national chemistry quiz started in 2002 with 10,399 students taking part and increasing steadily over the year to 39,068 in 2021,
- **Karnival Kimia Malaysia (K<sub>2</sub>M)** which is an annual public understanding of chemistry function aimed at secondary school students and the general public started in 2006. and
- Involved in the training of Malaysian students taking part in **International Chemistry Olympiad** or **IChO** since 2006

#### Tertiary Chemistry Education

At the tertiary level, Datuk Dr Soon serves in the Academic Advisory Board of a number of universities in Malaysia. He was also the Chairman of the IKM Examination Board that conducts the IKM Parts I & II Examinations for IKM Membership until 2013.

Datuk Dr Soon also serves as a member of the **National Council on the Teaching of Mathematics and Science** under the Ministry of Education Malaysia.

For his contribution to chemical education and public understanding of chemistry, IKM presented him with the **Tan Sri Dato’ Seri Law Hieng Ding Award** in 2010.

#### Asian Chemical Editorial Society (ACES)

At the international level, Datuk Dr Soon represents IKM in the Asian Chemical Editorial Society (ACES) which publishes the Chemistry – An Asian Journal by Wiley-VCH.

### **Organisation for the Prohibition of Chemical Weapons**

Datuk Dr Soon Ting Kueh also served as a member of the Temporary Working Group (TWG) on Education and Outreach under the Science Advisory Board (SAB) of the Organisation for the Prohibition of Chemical Weapons (OPCW). He had taken part in a number of international meetings on Education and Outreach of the Chemical Weapons Convention (CWC) including a Asian Meeting of OPCW National Authorities (NAs) held in Beijing in May 2015 and an Ethics Guidelines Workshop held in OPCW Headquarters in The Hague in September 2015. He also serves as a member of the Advisory Board on Education and Outreach of the Malaysian CWC National Authority.

### **Federation of Asian Chemical Societies (FACS)**

Dr Soon is also very active in the Federation of Asian Chemical Societies (FACS), being its President (2007 – 2009), the Coordinator of Projects from 2011 – 2015 and Treasurer from 2016 – 2019. His involvement with FACS started as early as 1995 when he served as Editor of Publications. He is very active in the Asian Chemical Education Network (ACEN) of FACS.

In the last few years, he is especially active in promoting collaborations among FACS member societies. He organized the Cambodian Malaysian Chemical Congress (CMCC) in Seam Reap, Cambodia in 2012 and the Vietnam Malaysian Chemical Congress (VMCC) in Hanoi, Vietnam in 2014

### **International Union of Pure & Applied Chemistry (IUPAC)**

Datuk Dr Soon plays an active role in the International Union of Pure & Applied Chemistry (IUPAC) He played an active part in the International of Chemistry (IYC) 2011 where he served as a Member of the IUPAC IYC Management Committee and also in the Global Stamp Competition.

In 2011, IKM organised the IUPAC International Conference on Chemical Research Applied to World Needs (ChemRAWN XIX) in Kuala Lumpur, Malaysia in 2011 and also the 24th IUPAC International Conference in Chemistry Education (ICCE) in Kuching, Malaysia in 2016.

He served as a Titular Member of IUPAC ChemRAWN Committee from 2011 – 2018.

Datuk Dr Soon is a National Representative of the IUPAC Committee on Chemistry Education (CCE) since 2009 and serves as a Titular Member from 2018 until present. At CCE, he brought the Young Ambassadors of Chemistry (YAC) program to Malaysia in 2012 and is currently involved in the Flying Chemist Program (FCP) and YAC.

In 2019 at the IUPAC 50th General Assembly (50GA) in Paris, IKM won the bid to organise the IUPAC 53rd General Assembly (53GA) and 50th World Chemistry Congress (50WCC) in Kuala Lumpur, Malaysia in 2025. At the same function, IKM also won the right to organise the 50th IUPAC World Polymer Congress (MACRO 2026) in Kuching, Malaysia in 2026.

Datuk Dr Soon Ting-Kueh has been very active in promoting the advancement of chemistry in Malaysia and Asia. He serves in the IKM Council since 1988 and has held many positions in IKM Council, including Chairman of Chemical Education Section since 1988 and President from 2007 – 2014. During his tenure as the President, IKM organized many international conferences and meetings such as the 7th Asian Chemical Congress (7ACC) in 2007, the 10th Asian Conference on Analytical Sciences (ASIANALYSIS X) in 2009 and the International Symposium on Pure and Applied Chemistry (ISPAC) in Kuching, Malaysia in 2016.

In 2012, Dr Soon was conferred a **Honorary Doctorate** by the Kazan National Research Technological University, Republic of Tatarstan, Russia and in 2013, he was admitted as a **Honorary Fellow** of the Singapore National Institute of Chemistry. For his contribution to the advancement of chemistry in Asia and the Pacific, Datuk Dr Soon Ting Kueh is awarded the **FACS Citation Award 2015**.

Datuk Dr Soon continues to play an active role in the advancement of chemistry worldwide. He also plays an important role in promoting chemistry education and public appreciation of chemistry among the younger generation and the general public.

INSTITUT DE FRANCE – ACADEMIE DES SCIENCES  
**COMITE NATIONAL DE LA CHIMIE**

28 rue Saint Dominique – 75341 PARIS Cedex 07

Président : Clément SANCHEZ

*Comité membre du COFUSI*

*Comité correspondant de l'IUPAC*



INSTITUT DE FRANCE  
Académie des sciences



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**To whom it may concern**

**Subject** : Support for Mr. Maestro's candidacy for the IUPAC Bureau

Paris, March 30, 2021

The *Comité National de la Chimie* is very proud to support the candidacy of Patrick Maestro, Scientific Director of Solvay, to run for the IUPAC Bureau.

The *Comité National de la Chimie* that represents France at IUPAC is very keen on promoting both fundamental and industrial chemistry. We have no doubt that Patrick Maestro will promote chemistry as a discipline, a profession and an industry as IUPAC does.

We are sure that Mr. Maestro can help us to accomplish the transformation of IUPAC promoted by the actual Bureau of IUPAC. These transformations will allow IUPAC to be as useful to chemists of the 21<sup>st</sup> century as it was to chemists of the 20<sup>th</sup> century.

Sincerely Yours,

Clément Sanchez  
CNC President

Professeur au Collège de France

Member of the French Academy of Sciences

Member of the French Academy of Technologies

Member of the European Academia of Sciences

Member of the Academia Europaea

MRS and RSC Fellow

---

SECRETAIRE GENERAL : Stanislas POMMERET

Téléphone: +33 6 78 84 74 34

[Stanislas.pommeret@societechimiquedefrance.fr](mailto:Stanislas.pommeret@societechimiquedefrance.fr)

Le Comité National de la Chimie est une association Loi 1901 – Registre RNA : W751028502

[www.cncchimie.org](http://www.cncchimie.org)

## **Patrick MAESTRO**

Born October, 10, 1952

### Training

Master of Physics and Chemistry, University of Bordeaux 1, 1974.

PhD in Physical and Chemical Sciences, CNRS Solid State Chemistry Laboratory, Bordeaux, May 1981: Synthesis and magnetic properties of ferromagnetic chrome dioxide derivatives.

### Key functions:

Research Engineer (Rhône-Poulenc Research Centre, Aubervilliers), from November 1980. Luminescence of Rare Earths.

From 1984 to 1995, setting up and responsible for the Rare Earth application laboratories. Luminescence, magnetism, electronics, catalysis. Coaching up to 100 people

Senior Fellow Scientist of the Rhône-Poulenc group (1995)

Scientific Advisor Rhône-Poulenc, then Rhodia (1998)

Scientific Director of Rhodia (2004)

Scientific Director of Solvay (2013)

### Description of works and achievements/publications/books:

1980s: in a structure-activity relationship approach, development of expertise and the concept of oxides and mixed salts as precursors of phosphors. This concept was widespread in the Rare Earth industry for phosphors, and has led to the development of Yttrium-Europium mixed oxides (red phosphor) and Lanthanum-Cerium-Terbium phosphates (green phosphor), which became industry standards for phosphor precursors for fluorescent lighting ("low consumption lamps"). Development of Rhodia's "Solid State Chemistry" team, and contributing to the development of new phases for catalysis (such as cerium-zirconium mixed oxides used today for automotive catalysis), magnetism (doping of neodymium-iron-boron magnets), electronics (anti-stokes phosphors for confidentiality tagging).

1990s: Discovery and development of colored pigments based on Rare Earths (Cerium Sulfides and derivatives). Focus of synthesis and relationship between composition (crystal structure), and color on the one hand, morphology and coloring power on the other hand (optics of solid). These pigments, with great thermal stability, were developed industrially by Rhodia for the coloring of technical plastics for the automotive market for example.

2000s: as scientific director of Rhodia, contribution to the group's long-term research and development policy, in particular through the creation of joint units with the academic world, in areas relevant to the group's long-term strategy: soft matter physics and chemistry (polymers and colloids, formulation..), mineral chemistry, thermoplastic and elastomer polymers, materials science, eco-responsible chemistry and catalysis.

Defined the scope and strategy of six advanced laboratories for the group, as well as the overall organization (scientific and technical exchanges, choice of people, connections with the outside world, support of young directors for laboratories,...), all in relation to the group's long-term business strategies.

Contribution to the development of a very strong relationship between the academic world and the industrial world, through this model of joint units bringing together, in one place and on

subjects shared from the upstream to the downstream, researchers from Rhodia and the academic world (permanent and students).

Like for example :

Laboratory of Advanced Materials (Solvay Research Centre in Lyon): it has been recognized as a major industrial and academic player on understanding the role of silica in the reinforcement of elastomers, and on understanding and improving the thermo-mechanical properties of polyamides. For example, this laboratory has enabled the development of new grades of rubber silica (application to the "green tire" with low rolling resistance and high wear resistance). The laboratory launched innovative projects on thermoplastic composites (replacement of heat-sensitive resins) and polymer powders (for rapid prototyping).

Creation of the LOF (Laboratory of the Future) in Pessac in 2004 to improve research productivity in Chemistry (microfluidics and robotics), accompanied by a high-level scientific project on the physics of flows in confined environments. Today, comprising 70 people, academic and industrial, the laboratory has increased our productivity by factors ranging from 100 to 1,000 for the acquisition of basic data for processes, and for the evaluation of the properties of formulations or materials. He is a world-renowned contributor to the study of the physics of discharge in confined environments, and the fundamental results, presented in the best scientific journals, contribute to the development of improved formulations, in cosmetics, lubricants, or for assisted oil recovery.

Established in Shanghai (2010) the International Joint Unit Solvay-CNRS-ENS Lyon-ECNU Shanghai on chemistry and eco-responsible processes, for the development of environmentally friendly surfactants, bio-sourced polymers, new pathways to access to vanillin, or the study of the transformation of CO<sub>2</sub> into chemicals, ....

#### **Various :**

Rhône-Poulenc Research Award (1994)

Chairman, Materials and Process Evaluation Committee, ANR, 2005 - 2009

Vice-President of the Board, Institut Polytechnique de Bordeaux (2010 - 2016)

Member of the Board, Ecole Nationale Supérieure de Chimie Paris (2010 - 2014)

Regular member of audit committees for French evaluation bodies like HCRES

Member of the Scientific Council of the Institute of Higher Studies for Science and Technology (2008 - 2014)

Member of the Aquitaine Development Innovation Directorate, since 2013

Member of the CNRS Scientific Council (2010 - 2015)

Member of the French Academy of Technologies since 2015

Recipient of the CNRS Innovation Medal 2015

Knight of the "Legion d'Honneur" 2018

#### **Publications**

20 patents, 50 Publications, 40 invited lectures

Participation in about 50 thesis or HDR juries



*The National Academies of*  
SCIENCES • ENGINEERING • MEDICINE

**U.S. National Committee for the  
International Union of Pure and Applied Chemistry**

23 March 2021

Dr. Richard Hartshorn  
IUPAC Secretary General  
IUPAC Secretariat  
P.O. Box 13757  
Research Triangle Park, NC 27709

Dear Dr. Hartshorn,

On behalf of the U.S. National Committee (USNC) for IUPAC, the U.S. National Academies would like to nominate Dr. Laura McConnell for the position of Elected Member of the IUPAC Bureau.


Currently a Bayer Science Fellow, Dr. McConnell previously held a role at the global intersection of industry, academia, and government in the critical area of regulatory science affairs. The way this position bridged these sectors gives her a unique perspective of the needs of the field in a way that would benefit the Bureau's vision and mission.

Dr. McConnell has been an exemplary contributor to IUPAC over the last fifteen years, rising to Emeritus Fellow of Division VI. Throughout, she has continuously worked to increase and diversify participation in Division VI in addition to her work on numerous projects on soil contaminants and other topics. Her familiarity with the Union and active engagement to date will be important assets for the Bureau when thinking strategically about the future of IUPAC.

As a co-chair of the Global Women's Breakfast, Dr. McConnell has been a champion of inclusivity and reducing the gender gap in chemistry. Leveraging the reach of IUPAC has been an effective strategy in providing access to networking by women chemists around the world. Her emphasis on mentorship and support of incoming members of the community is notable, also reflected in her work with the International Younger Chemists Network (IYCN) and USNC Young Observer program. Her efforts in this arena are important for increasing the awareness and impact of IUPAC on younger chemists, as well as strengthen the chemistry enterprise as a whole.

Dr. Laura McConnell has shown a commitment to and leadership in the chemistry community, and the U.S. National Committee believes that IUPAC would benefit tremendously from having her serve as an Elected Member of the Bureau.

Respectfully,

  
Liana Vaccari, PhD  
Program Officer

#### Short Biosketch:

Dr. Laura L. McConnell Science Fellow in the Regulatory Scientific Affairs team at Bayer Crop Science in St. Louis Missouri. At Bayer she leads global engagement with Universities and Scientific Societies on regulatory science topics. Her expertise is in the field of analytical and environmental chemistry. Prior to coming to Bayer, she was a Lead Scientist and Research Chemist at the U.S. Department of Agriculture for more than twenty years. Within IUPAC, Dr. McConnell served continuously as a Division VI member for approximately 15 years, serving as an officer from 2010 to 2018. During that time, she worked to expand the number and diversity of members participating in Division VI activities and to raise the profile of the division within IUPAC. She was recently named Emeritus Fellow of Division VI. She served as a co-organizer of the World Chemistry Leadership Meeting at the 2015 Busan World Chemistry Congress. She served as co-chair of the IUPAC100 committee. She currently serves as co-chair of the Global Women's Breakfast committee. She has also served as the Chair of the United States National Committee for IUPAC and led the US delegation at Council during the last two biennial IUPAC General Assemblies.

## **Dr. Laura Lee McConnell**

Bayer U.S. LLC, Crop Science Division  
700 Chesterfield Parkway W  
FF-3339-A  
Chesterfield, MO 63017  
Ph: 919-475-5980  
Email: laura.mcconnell@bayer.com

### **EDUCATION**

Ph.D. Chemistry and Biochemistry, University of South Carolina, Columbia, SC, May 1992

B.S. Chemistry, College of Charleston, Charleston, SC, May 1987

### **PROFESSIONAL EMPLOYMENT**

2019 – Present	Bayer Science Fellow, University and Scientific Society Engagement Lead, Regulatory & Scientific Engagement, Regulatory Scientific Affairs, St. Louis, Missouri
2013 – 2019	Environmental Fate Coordinator and Water Stewardship Lead, Environmental Safety, Research Triangle Park, North Carolina
1997- 2013	Lead Scientist, Research Chemist, US Department of Agriculture, Agricultural Research Service, Beltsville, Maryland
1992-1997	Research Chemist (Term Appointment), US Department of Agriculture, Agricultural Research Service, Beltsville, Maryland

### **AWARDS**

2020 Emeritus Fellow Award, International Union of Pure and Applied Chemistry

2014 Fellow Award, American Chemical Society.

1992 Iota Sigma Pi (National Honor Society for Women in Chemistry), Anna Louise Hoffman Award for Outstanding Achievement in Graduate Research, sponsored by the American Chemical Society, Women Chemists Committee.

### **LEADERSHIP IN SCIENTIFIC SOCIETIES**

#### **American Chemical Society (ACS)**

2012-Present AGRO Division Webinar Committee Chair

2012-2018 Associate Member, ACS Committee for Environmental Improvement.

2005-2007 Elected Vice Chair, Program Chair, Chair, Division of Agrochemicals.

#### **International Union of Pure and Applied Chemistry (IUPAC)**

2019-2021 Co-Chair IUPAC Global Women's Breakfast

2017-2019 Co-Chair, IUPAC100 100<sup>th</sup> Anniversary Committee

2015-2021 Chair and Past Chair of IUPAC US National Committee

2010-2017 Vice President, President and Past President of IUPAC Division of Chemistry and the Environment

### **IUPAC PROJECTS**

2020-012-2-020 – IYCN-IUPAC Younger Chemist Showcase (ChemVoices)

2020-010-2-020 – Creation of IUPAC Global Women's Breakfast Series and a Global Network in Support of Eliminating the Gender Gap in the Chemical Sciences

2016-016-2-600 - Guidance for Industry and Regulators on Assessment of the Environmental Fate and Risks of Nano-enabled Pesticides

2014-032-1-600 - Advances on the Assessment of Pesticides' Soil Microbial toxicity: New research and regulatory aspects in light of the recent methodological advances

#### **JOURNAL EDITORSHIPS AND EDITORIAL BOARDS**

2020-Present Deputy Editor, *ACS Agricultural Science and Technology* (New Journal)

2019-2020 Associate Editor, *Pest Management Science*

2012-2015 Associate Editor, *Environmental Science and Pollution Research*

#### **PEER-REVIEWED JOURNAL PUBLICATIONS (10 MOST RELEVANT OUT OF 102 TOTAL)**

1. Levine, S.L., Giddings, J., Valenti, T., Cobb, G.P., Carley, D.S. & **McConnell, L.L.** Overcoming Challenges of Incorporating Higher Tier Data in Ecological Risk Assessments and Risk Management of Pesticides in the United States: Findings and Recommendations from the 2017 Workshop on Regulation and Innovation in Agriculture, Integrated Environmental Assessment and Management, vol. 15, no. 5, pp. 714-725. 2019.
2. Molyneux, R.J., Beck, J.J., Colegate, S.M., Edgar, J.A., Gaffield, W., Gilbert, J., Hofmann, T., **McConnell, L.L.** & Schieberle, P. Guidelines for unequivocal structural identification of compounds with biological activity of significance in food chemistry (IUPAC Technical Report)", *Pure and Applied Chemistry*, vol. 91, no. 8, pp. 1417-1437. 2019.
3. Schmidt, W.F., Hapeman, C.J., **McConnell, L.L.**, Rice, C.P., Broadhurst, C.L., Nguyen, J.K., Qin, J., Chao, K., Kim, M.S. & Shelton, D.R. Using torsional forces to explain the gradient temperature Raman spectra of endosulfan isomers and its irreversible isomerization. *Journal of Molecular Structure*, vol. 1139, pp. 43-51. 2017.
4. **McConnell, L.L.**, Racke, K.D., Hapeman, C.J. & Seiber, J.N. 13th IUPAC International Congress of Pesticide Chemistry: Crop, Environment, and Public Health Protection, Technologies for a Changing World. *Journal of Agricultural and Food Chemistry*, vol. 64, no. 1, pp. 4-5. 2016.
5. Centofanti, T., **McConnell, L.L.**, Chaney, R.L., Beyer, N.W., Andrade, N.A., Hapeman, C.J., Torrents, A., Nguyen, A., Anderson, M.O., Novak, J.M. & Jackson, D. Organic amendments for risk mitigation of organochlorine pesticide residues in old orchard soils, *Environmental Pollution*, vol. 210, pp. 182-191. 2016.
6. Xu, T., Dyer, D.G., **McConnell, L.L.**, Bondarenko, S., Allen, R. & Heinemann, O. Clothianidin in agricultural soils and uptake into corn pollen and canola nectar after multiyear seed treatment applications. *Environmental Toxicology and Chemistry*, vol. 35, no. 2, pp. 311-321. 2016.
7. Ziska, L.H. & **McConnell, L.L.** Climate Change, Carbon Dioxide, and Pest Biology: Monitor, Mitigate, Manage. *Journal of Agricultural and Food Chemistry*, vol. 64, no. 1, pp. 6-12. 2016.
8. Kim, J.H., Chan, K.L. & **McConnell, L.L.** Augmenting the efficacy of fungal and mycotoxin control via chemosensitization. *Outlooks on Pest Management*, vol. 26, no. 4, pp. 171-175. 2015.
9. McCarty, G.W., Hapeman, C.J., Rice, C.P., Hively, W.D., **McConnell, L.L.**, Sadeghi, A.M., Lang, M.W., Whittall, D.R., Bialek, K. & Downey, P. Metolachlor metabolite (MESA) reveals agricultural nitrate-N fate and transport in Choptank River watershed. *Science of the Total Environment*, vol. 473-474, pp. 473-482. 2014.
10. Schmidt, W.F., Hapeman, C.J., **McConnell, L.L.**, Mookherji, S., Rice, C.P., Nguyen, J.K., Qin, J., Lee, H., Chao, K. & Kim, M.S. Temperature-dependent raman spectroscopic evidence of and molecular mechanism for irreversible isomerization of  $\beta$ -endosulfan to  $\alpha$ -endosulfan. *Journal of Agricultural and Food Chemistry*, vol. 62, no. 9, pp. 2023-2030. 2014.

## ZOLTAN MESTER

Zoltan Mester completed his PhD in chemistry splitting his time between his alma mater in Budapest and Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), Rome, Italy. After his graduation he joined University of Waterloo, Canada and developing novel microextraction methodologies. In 1999 accepted a position at the National Research Council Canada (NRC) in Ottawa, Canada where since 2010 he is heading the inorganic chemical measurement science research program. His research interest is focused on the analytical use of mass spectrometry. Under his leadership NRC has established a program in stable isotope ratio mass spectrometry. Since 2012 he has championed the digital transformation of chemical data delivery and created the first electronic repository of Reference Materials within the Canadian National Science Library.

Since 2005, he has been active at the International Union of Pure and Applied Chemistry (IUPAC), in increasingly senior roles, where he is currently completing his second and final term as the President of the Analytical Chemistry Division. At IUPAC he has spearheaded major organizational update of the Division from strategic planning, articulating long- and short-term vision to execution working with stakeholders and staff. He has a deep understanding both of the scientific aspirations and the practical operation of the Union.

Since 2010 he has been representing Canada at the Consultative Committee for Amount of Substance (CCQM) of the Metre Convention (international treaty, curating the system of units, the SI). In his role, he championed the cooperation of IUPAC and CCQM on the new SI and redefinition of the unit mole and also negotiated the formalization of the relationship between the IUPAC and BIPM by signing an MOU.

In 2020 he began his term as the Vice Chair (Chair elect) of the Cooperation on International Traceability in Analytical Chemistry (CITAC) which the oldest international organization dedicated to the advancement of chemical measurement science and academic and governmental collaborations.

Apart from research and international outreach activities he is also involved training the next generation of analytical chemists by hosting students in his laboratories at NRC. He delivered /contributed to courses at universities in more than 20 countries and maintained adjunct professorships at two Canadian universities.

He has published over 225 peer reviewed papers, 3 book chapters and one book. His papers receive around 500 citations annually. Over the years he gave numerous invited/keynote presentations at conferences around world.

### PUBLICATIONS:

<http://orcid.org/0000-0002-2377-2615>

### NETWORKING:

[www.linkedin.com/in/zoltanmester](http://www.linkedin.com/in/zoltanmester)

<b>1. AREA(S) OF RESEARCH</b>
Metrology in chemistry; Mass spectrometry; Trace element speciation
<b>2. EMPLOYMENT HISTORY</b>
1999–present, Research Scientist, Chemical Metrology, National Research Council Canada
<b>3. EDUCATION</b>
Postdoctoral Fellow 1999, University of Waterloo, Waterloo, Canada Ph.D. 1998, Dep. of Chemistry, Univ. of Horticulture and Food Industry, Budapest, Hungary M.Sc. 1994, Dep. of Food Chemistry, Univ. of Horticulture and Food Industry, Budapest, Hungary
<b>4. NATIONAL AND INTERNATIONAL OUTREACH, COMMITTEES</b>
<p>-2006–present: International Union for Pure and Applied Chemistry (IUPAC) Analytical Chemistry division. Various roles, including <b>President (2018-2021)</b>, Vice president, Secretary, member  <a href="https://iupac.org/who-we-are/divisions/division-details/?body_code=500">https://iupac.org/who-we-are/divisions/division-details/?body_code=500</a></p> <p>-2010–present: Metre Convention, Consultative Committee for Amount of Substance: Metrology in Chemistry and Biology (CCQM), <b>Canadian delegate</b>  <a href="https://www.bipm.org/en/committees/cc/ccqm/">https://www.bipm.org/en/committees/cc/ccqm/</a></p> <p>-2010–present: CCQM working groups (strategic planning, biology, key comparisons), <b>founder and current Chair of Isotope Ratio Working Group</b>  <a href="https://www.bipm.org/en/committees/cc/wg/irwg.html">https://www.bipm.org/en/committees/cc/wg/irwg.html</a></p> <p>-2017–present: Joint Committee for Guides in Metrology, <b>Lead delegate</b> of IUPAC  <a href="https://www.iso.org/sites/JCGM/JCGM-introduction.htm">https://www.iso.org/sites/JCGM/JCGM-introduction.htm</a></p> <p>-2013–present: Inter-American Metrology System; Chemistry working group, <b>National representative</b>  <a href="https://sim-metrologia.org/about-us/structure/technical-committee/chemistry/">https://sim-metrologia.org/about-us/structure/technical-committee/chemistry/</a></p> <p>-2013–present: Canadian Mirror Committee of ISO Committee on Reference Materials, founder and current <b>chair</b> and <b>convenor</b> of the working group on inorganic purities;  <a href="https://www.iso.org/committee/55002.html">https://www.iso.org/committee/55002.html</a></p> <p>-2020–present: <b>Vice Chair (Chair Elect)</b> of Cooperation on International Traceability in Analytical Chemistry (CITAC)  <a href="http://www.citac.cc/">http://www.citac.cc/</a></p>
<b>5. SCHOLARLY AND PROFESSIONAL ACTIVITIES</b>
<p>-2010–2012: Spectrochimica Acta B, Review Editor  -2012–2016: Analytica Chimica Acta, Editorial Board  -2016–present: Journal of Pure and Applied Chemistry, Editorial Board  -2018–present: Accreditation and Quality Assurance, International Advisory Board  -2005–present: Canadian &amp; US, EU funding agencies, research grant proposal reviewer/committee/panel member  -2012–present: Technical auditor/reviewer/advisory board member of various scientific organizations in Japan, Hong Kong, Colombia, Czech Republic, Australia, Croatia, Mexico, Uruguay, Canada  -2005–present: Teach courses in Canada and internationally on analytical chemistry and chemical metrology, and adjunct professor at Queen's and Trent Universities in Canada.  -2012–present: Leading collaborative research efforts between in ASEAN region and NRC Canada in the field chemical measurement science. He championed strategic MOU between Thailand Ministry of Science and Technology and National Research Council of Canada (2018).</p>

6. SUPERVISION AND TRAINING OF HQPs				
Hired, supervised and trained 30+ staff scientists over 15 years. His research team has been attracting talent from all over the world. Dr. Mester's lab has been hosting 5-10 visiting scientists, postdocs and graduate students annually, from 20+ countries.				
7. MAJOR PROJECTS AND GRANTS				
DATE	Value	ROLE	PARTNERS	TITLE
2015–2018	\$700K project, -\$6M CRM inventory created	PI	Canadian Nuclear Safety Commission and 30 international partners	Reference Material (CRM) development of Nuclear Forensics
2011–2017	\$10M+ overall project \$0.7M Canadian project	NRC Project Lead	PTB, Germany NIST, US NMIJ, Japan NIM, China	redefinition of the kilogram + redefinition of mole, new SI. Metre Convention
2005–2018	\$3M	PI	Canadian Safety and Security Program Chemical, CBRNE Research and Technology Initiative	Four consecutive projects on chemical detection
2010–present	\$5.5M since 2010 in research contracts	PI	Partners from 50+ countries, from industry, governments and academia	Support international measurement comparability via the provision of CRMs and calibrations
2010–present	\$8M in research and service contracts	PI	80+ companies and research organizations annually.	Glow discharge mass spectrometry (supporting, medical devices, aerospace sectors)
2005–present	\$5.7M	PI	Various funding sources	Major lab instrumentation grants
8. PUBLICATIONS AND INTELLECTUAL PROPERTY SUMMARY				
PUBLICATION TYPE			CAREER TOTAL	TOTAL (last 5 years)
Patents			7	0
Other IP outputs (trade secrets, etc.)			6	4
Peer-reviewed publications (journals and conference proceedings)			225	67
Books and book chapters			4	3
Standards, guides			1	0
Invited lectures			75	28

Dr. Mester's work has been cited 8,478 times and has an *h*-index of 52.

<https://scholar.google.ca/citations?user=hHBkWsgAAAAJ&hl=en;>

<http://orcid.org/0000-0002-2377-2615;>

31 March 2021

Dr Lynn Soby  
Executive Director  
IUPAC Secretariat  
Email: [lsoby@iupac.org](mailto:lsoby@iupac.org)

Dear Dr Soby

**RE: Nomination to the IUPAC Bureau 2022-2023 - Professor Gregory T. Russell**

Further to the Call for Nominations for IUPAC Offices and Bureau Members, Royal Society Te Apārangi as New Zealand's National Adhering Organisation to IUPAC, we wish to submit our nomination of Professor Gregory T. Russell for the position of Bureau Member. The New Zealand Institute of Chemistry also endorses our nomination.

In addition to the Curriculum Vitae and Biographical sketch, the following details are provided:

Nominee Full Name	Associate Professor Gregory T Russell
Gender	Male
Address	College of Science University of Canterbury Private Bag 4800 Christchurch 8140, New Zealand
Email	<a href="mailto:greg.russell@canterbury.ac.nz">greg.russell@canterbury.ac.nz</a>
Website	<a href="https://www.canterbury.ac.nz/science/contact-us/people/greg-russell.html">https://www.canterbury.ac.nz/science/contact-us/people/greg-russell.html</a>

**Royal Society Te Apārangi**

11 Turnbull Street, Thorndon, Wellington 6011

PO Box 598, Wellington 6140, New Zealand

T +64 4 472 7421

**ROYALSOCIETY.ORG.NZ**

Please confirm receipt of this nomination and please let us know if you require any additional information.

Yours sincerely

A handwritten signature in black ink, appearing to read 'C Kiro', written on a light grey background.

**Professor Dame Cynthia Kiro**  
Ahorangi CEO Royal Society Te Apārangi

## Candidacy Sketch – Prof. Gregory T. Russell



Recently the Secretary General made a profound observation:

“with only five paid employees, the Secretariat staff, it would be hard to argue that IUPAC was large. On the other hand, IUPAC currently has around 2000 scientists actively involved in its Divisions, Committees, Commissions, and Project Task Groups.”  
(*Chem. Int.*, **40**(2), 2)

The IUPAC Bureau sits at the apex of this vast volunteer network. As a member of the Bureau, one must therefore be intimately aware of the array of work going on underneath. It is such knowledge and experience I would bring to the Bureau, having been involved in many facets of this voluntary work over the last 3 decades, starting even in my days as a PhD student, and ongoing to this day. My work has covered all the major strands of IUPAC’s mission:

- Education and outreach through Div. IV’s *Subcommittee on Polymer Education* (since 2006)
- Terminology and nomenclature through Div. IV’s *Subcommittee on Polymer Terminology* (since 2011)
- Data evaluation and method standardization through Div. IV’s *Subcommittee on Modeling of Polymerization Kinetics and Processes* (since 1991) and the *Interdivisional Subcommittee on Critical Evaluation of Data* (since 2018)
- Leadership through *Bureau* membership (2016-19), a full officer cycle (Vice-President, President, Past-President; 2012-2021) in Div. IV, and *Kinetics Subcommittee* chairpersonship (2007-12)
- Conference organization (numerous examples, both under the IUPAC banner and separate to it)

- Project work (19 in all), mostly resulting in publications, many of which have been highly cited
- Award organization, judging and promotion (Solvay Award, and Div. IV's *Polymer International*, Hanwha Total, DSM and Stepto Awards, the latter of which I started in recognition of the passing of a Division Past-President)

If one has done all these things, then it's easier to guide others in doing them.

I believe in IUPAC activity through both traditional ways (conferences, journal publications, etc.) and more modern means, e.g. I started <https://twitter.com/IUPACPolymer>, I have championed Div. IV's forays into Wikipedia, and I have worked on Div. IV's Brief Guides. I believe it is vital for IUPAC to be involved in current issues, e.g. I am a member of an interdivisional project on microplastics in the environment, and I have ensured Div. IV is part of IUPAC's engagement with OPCW.

I do all this with a background of research excellence, a commitment to rigorous educational standards, and a deep belief in selfless service and friendly international cooperation infused by diversity and IUPAC's family-like values.

# Curriculum Vitae – Prof. Gregory T. Russell

## Personal Details

Date of Birth: 30 October 1963  
Nationality: Born in **Australia**, permanent resident of **New Zealand** (since 1994)  
Languages: Native tongue **English**, fluent in **German**, school-level **French**  
Family: Wife **Christine Prince**, daughter **Isabelle** (b. 18 July 2004), step-daughter **Scarlett** (b. 7 August 2004), son **Sebastian** (b. 29 March 2008)

## Degrees and Career

**1982-85:** *Bachelor of Science* with *First Class Honours* in Chemistry at the **University of Sydney**  
**1986-90:** *Ph.D. (Science)* in Physical and Theoretical Chemistry at the **University of Sydney**  
**1991-94:** Alexander von Humboldt *Research Fellow* at the Institut für Physikalische Chemie der **Universität Göttingen** (Germany).  
**1994-present:** *tenured academic position* in the Department of Chemistry, School of Physical and Chemical Sciences at the **University of Canterbury**, Christchurch (New Zealand)  
**2002, 2010:** sabbatical years in Australia (2002), USA (2002) and Germany (2002, 2010)

## Research and Publications

**General Area of Research:** Radical polymerization – kinetics, mechanisms and synthesis

**Publications:** Over 90 publications, including 6 book chapters, 1 patent, 4 invited reviews, 8 invited journal articles and 70 refereed journal articles

**Citations:** *h-index:* 38; *total citations:* 5 739 (average per refereed item: 82) (from Google Scholar, 30 March 2021).

**Research students supervised:** 8 Ph.D. (all graduated), 1 M.Sc. (graduated), 1 PG.Dip.Sc. (graduated) and 11 Honours (all graduated)

## IUPAC Service

**Bureau:** *member* (appointed) 2016-19

**Committee of Division Presidents and Standing Committee Chairs:** *chair* (elected) 2018-19, *member* 2016-17

**Division IV (Polymer Division):** *Titular member* 2008-11, *Vice-President* 2012-15, *President* 2016-19, *Past President* 2020-21 (all elected positions), *National Representative* 1999-2004

**Subcommittee on Modeling of Polymerization Kinetics and Processes:** *chair* (elected) 2007-12, *deputy chair* (elected) 2003-07, *member* 1991-present

**Subcommittee on Polymer Education:** *member* 2006-present

**Subcommittee on Polymer Terminology:** *member* 2011-present

**Interdivisional Subcommittee on Critical Evaluation of Data:** *member* 2018-present

**Interdivisional Subcommittee on Materials Chemistry:** *member* 2013-present

**Projects:** 19 in all (12 current, 7 completed) over 2000-present, including 2 as *chair*

**Solvay Award:** *member of judging panel* (appointed) 2016, 2017, 2018, 2019

### **Awards and Notable Achievements (outside of IUPAC)**

---

**2019-20:** *Guest editor of Polymers Special Issue on “Advanced Polymeric Materials”*  
([https://www.mdpi.com/journal/polymers/special\\_issues/advanced\\_polymeric\\_materials](https://www.mdpi.com/journal/polymers/special_issues/advanced_polymeric_materials))

**2019:** *Member of scientific program committee*, 47th IUPAC World Chemistry Congress (Paris, France, 7–12 July 2019)

**2017-18:** *Guest editor of Polymers Special Issue on “Emulsion Polymerization”*  
([http://www.mdpi.com/journal/polymers/special\\_issues/Emulsion\\_Polymerization](http://www.mdpi.com/journal/polymers/special_issues/Emulsion_Polymerization))

**2016:** *Honorary Chairman and Member of International Advisory Committee*, MACRO 2016 – 46th IUPAC World Polymer Congress: Bridging Continents & Bridging Molecules (Istanbul, Turkey, 17-21 Jul. 2016)

**2012:** *Member of International Advisory Committee*, 44th International Symposium on Macromolecules (MACRO 2012) – IUPAC World Polymer Congress: Enabling Technologies for a Safe, Sustainable, Healthy World (Blacksburg VA, USA, 24-29 Jun. 2012)

**2010:** *Member of International Advisory Board*, Polymer Science in the Service of Society: 43rd IUPAC World Polymer Congress, Macro2010 (Glasgow, UK, 11-16 Jul. 2010)

**2009-present:** *Member of the Editorial Board* of the journal *Polymers* (ISSN 2073-4360, <http://www.mdpi.com/journal/polymers/>)

**2008-17:** *Councilor*, Australian Institute of Nuclear Science and Engineering

**2006:** *Co-Chair*, Theory of Molecular and Macromolecular Kinetics: A Symposium in Honour of Professor Bob Gilbert’s 60th Birthday (Sydney, Australia, 20-22 Oct. 2006)

**2006:** *Guest Editor*, *Australian Journal of Chemistry* Special Issue on “Polymer Chemistry Meets Biomaterials” (Vol. 59, No. 8, 2006)

**2006:** *Chair*, Organizing and Scientific Committees for the 28th Australasian Polymer Symposium and 16th Annual Conference of the Australasian Society for Biomaterials (Rotorua, New Zealand, 5-9 Feb. 2006)

**2005:** *FRACI*, Elected to Fellowship of the Royal Australian Chemical Institute

**2004-06:** *Chair*, Polymer Division of the Royal Australian Chemical Institute

**2003:** Royal Australian Chemical Institute *Polymer Division Citation* “for scientific achievement in the study of the mechanisms of free radical polymerization and for services to the Polymer Division”

**1996-98:** *Chair*, Canterbury Branch of the New Zealand Institute of Chemistry

**1996:** *Rennie Memorial Medal* of the Royal Australian Chemical Institute, for the young chemist (under 33 years of age) who has made the most significant contribution to published research in the last ten years

**1991:** *Alexander von Humboldt Research Fellowship* granted by the Alexander von Humboldt Foundation of the Federal Republic of Germany

**1986:** *University Medal* from the University of Sydney

## Ken Sakai

**Affiliation:** Professor of Inorganic and Analytical Chemistry, Department of Chemistry, Faculty of Sciences, Kyushu University.

**Address:** Department of Chemistry, Faculty of Science, Kyushu University, Motoooka 744, Nishi-ku, Fukuoka 819-0395, Japan

**E-mail:** [ksakai@chem.kyushu-univ.jp](mailto:ksakai@chem.kyushu-univ.jp)

Lab. Website: <http://www.scc.kyushu-u.ac.jp/Sakutai/index.eng.html>

ORCID (Ken Sakai): <https://orcid.org/0000-0003-4976-9796>

Publons (Ken Sakai): <https://publons.com/researcher/3996058/ken-sakai/>



KS studied in Tokyo at Waseda University, obtained Ph.D. in 1993 from Waseda, was a Research Associate at Seikei University (1991-1999), an Associate Professor at Tokyo University of Science (1999-2004), and promoted as a full professor in 2004. His degree thesis was focused on the syntheses, crystal structures, and homogeneous catalytic reactions of multinuclear platinum mixed-valence complexes, with his special interests on water oxidation, water reduction, and dioxygen reduction. During his study at Waseda, he gained an extremely large variety of analytical techniques, such as chromatography, electrochemistry, X-ray crystallography, EPR, MS, NMR, stopped-flow, photocatalysis, etc. Rotating ring disk electrode system was also used to analyze the mechanism of dioxygen reduction using molecular catalysts. After receiving his degree, he extended his studies on (i) photocatalytic water reduction to molecular hydrogen using platinum-based homogeneous catalysts and (ii) development of conductive one-dimensional platinum chain complexes having partially oxidized valence. Besides these studies, he also promoted his research projects on (iii) equilibrium and kinetics of the reactions by various transition metal complexes. By promoting various projects, he gradually increased his areas of research and improved his ability to develop various original apparatus, instruments, and computer applications. The recent remarkable results involve (a) Pt-based photo-molecular devices for H<sub>2</sub> generation, (b) single-site-Co POMs and porphyrins for water oxidation catalysis, (c) Co porphyrins for CO<sub>2</sub> reduction, and (d) Fe-, Co-, and Ni-catalysts for electrocatalytic H<sup>+</sup> and CO<sub>2</sub> reduction. The recent study is largely focused on the development of truly useful artificial photosynthetic devices for the overall water splitting and the CO<sub>2</sub> reduction to fuels (e.g., CO, HCOOH, MeOH, and CH<sub>4</sub>) combined with water oxidation catalysis. In addition to his research activity, he also greatly devoted his time in help organizing domestic and international conferences in the coordination chemistry society as well as those for the America Chemical Society (ACS) and the Chemical Society of Japan (CSJ). He has been involved in the IUPAC activities in the last 14 years, currently Bureau and Division II NR. During the last four years, he was a chairman of SCJ (Science Council of Japan), which is one of the NAOs of IUPAC. He had a great contribution to the organization of domestic activities for the IYPT2019 as a chairman of the IYPT2019 planning subcommittee specially located within SCJ leading to make great success in the organization of the IYPT2019 closing ceremony held in Tokyo on December 2019.

## Ken Sakai

**Affiliation:** Professor of Inorganic and Analytical Chemistry, Department of Chemistry, Faculty of Sciences, Kyushu University.

**Address:** Department of Chemistry, Faculty of Science, Kyushu University, Motoooka 744, Nishi-ku, Fukuoka 819-0395, Japan

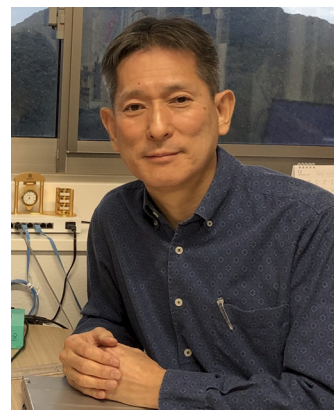
**Phone/Fax:** +81-92-802-4169

**E-mail:** ksakai@chem.kyushu-univ.jp

Lab. Website: <http://www.scc.kyushu-u.ac.jp/Sakutai/index.eng.html>

ORCID (Ken Sakai): <https://orcid.org/0000-0003-4976-9796>

Publons (Ken Sakai): <https://publons.com/researcher/3996058/ken-sakai/>



### Education

1989 – 1991 Ph.D. Waseda University (Thesis 1993)

1987 – 1989 M. S. Waseda University (Chemistry)

1983 – 1987 B. S. Waseda University (Chemistry)

### Professional Career

2018.08 – 2020.07 IYPT2019 Managing Committee Member (IUAPC/UNESCO)

2018.06 – 2020.03 IYPT2019 Planning Subcommittee Chairman (SCJ)

2017.12 – 2020.12 IUPAC Subcommittee Chairman (SCJ)

2014.10 – Present Member of Science Council of Japan (SCJ)

2012.01 – 2020.03 Principal Investigator, International Institute for Carbon Neutral Energy Research (WPI-I2CNER), Kyushu University

2011.04 – Present Professor, Center for Molecular Systems (CMS), Kyushu University

2004.08 – Present Professor, Department of Chemistry, Kyushu University

2003.04 – 2004.07 Associate Professor, Dept. Appl. Chem., Tokyo University of Science

1999.04 – 2003.03 Lecturer, Dept. Appl. Chem., Tokyo University of Science

1991.04 – 1999.03 Assistant Professor, Dept. Industrial Chem., Seikei University

### Activities in IUPAC

2007 Observer, attended General Assembly Meeting in Torino, Italy

2008-2009 Associate Member of Inorganic Chemistry Division (Division II)

2010-2013 Titular Member of Inorganic Chemistry Division (Division II)

2014-2015 Associate Member of Inorganic Chemistry Division (Division II)

2016-2017 Associate Member of Inorganic Chemistry Division (Division II)

2018-2019 National Representative of Inorganic Chemistry Division (Division II)

2017-2021 Elected Bureau

### Project in IUPAC

Project No. 2009-045-1-200: Guidelines for Measurement of Luminescence Spectra and Quantum Yields of Inorganic Compounds, Metal Complexes and Materials

## Selected Publications

1. "Mechanisms of Water Oxidation using Ruthenium, Cobalt, Copper, and Iron Molecular Catalysts", A. R. Parent, T. Nakazono, Y. Tsubonouchi, N. Taira and K. Sakai, *Adv. Inorg. Chem.* **2019**, *74*, 197-240.
2. "Highly Efficient and Selective Photocatalytic CO<sub>2</sub> Reduction to CO in Water by a Cobalt Porphyrin Molecular Catalyst", A. Call, M. Cibian, K. Yamamoto, T. Nakazono, K. Yamauchi, and K. Sakai, *ACS Catal.* **2019**, *9*, 4867-4874.
3. "Photochemical CO<sub>2</sub> Reduction Driven by Water-Soluble Copper(I) Photosensitizer with the Catalysis Accelerated by Multi-Electron Chargeable Cobalt Porphyrin", X. Zhang, M. Cibian, A. Call, K. Yamauchi, and K. Sakai, *ACS Catal.* **2019**, *9*, 11263-11273.
4. "A Molecular Cobalt Hydrogen Evolution Catalyst Showing High Activity and Outstanding Tolerance to CO and O<sub>2</sub>", J.-W. Wang, K. Yamauchi, H.-H. Huang, J.-K. Sun, Z.-M. Luo, D.-C. Zhong, T.-B. Lu, and K. Sakai, *Angew. Chem. Int. Ed.* **2019**, *58*, 10923-10927.
5. "Near-Infrared-Light-Driven Hydrogen Evolution from Water using a Polypyridyl Triruthenium Photosensitizer", Y. Tsuji, K. Yamamoto, K. Yamauchi, and K. Sakai, *Angew. Chem. Int. Ed.* **2018**, *57*, 208-212 (Cover Picture).
6. "A Nickel Dithiolate Water Reduction Catalyst Providing Ligand-based Proton-coupled Electron Transfer Pathways", K. Koshiba, K. Yamauchi, and K. Sakai, *Angew. Chem. Int. Ed.* **2017**, *56*, 4247-4251.
7. "One-dimensional Magnus-type platinum double salts", C. H. Hendon, A. Walsh, N. Akiyama, Y. Konno, T. Kajiwara, T. Ito, H. Kitagawa, and K. Sakai, *Nat. Commun.* **2016**, *7*, 11950.
8. "Molecular photo-charge-separators enabling single-pigment-driven multi-electron transfer and storage leading to H<sub>2</sub> evolution from water", K. Kitamoto, M. Ogawa, G. Ajayakumar, S. Masaoka, H.-B. Kraatz, and K. Sakai, *Inorg. Chem. Front.*, **2016**, *3*, 671-680.
9. "Pigment-Acceptor-Catalyst Triads for Photochemical Hydrogen Evolution", K. Kitamoto and K. Sakai, *Angew. Chem. Int. Ed.* **2014**, *53*, 4618-4622.
10. "Three Distinct Redox States of an Oxo-Bridged Dinuclear Ruthenium Complex", M. Yoshida, M. Kondo, T. Nakamura, K. Sakai, and S. Masaoka, *Angew. Chem. Int. Ed.* **2014**, *53*, 11519-11523.
11. "Progress in Base-Metal Water Oxidation Catalysis", A. R. Parent and K. Sakai, *ChemSusChem* **2014**, *7*, 2070-2080.
12. "Cobalt Porphyrins as Homogeneous Catalysts for Water Oxidation", T. Nakazono, A.R. Parent, K. Sakai, *Chem. Commun.* **2013**, *49*, 6325-6327.
13. "Photoinduced Hydrogen Evolution from Water Based on a Z-Scheme Photosynthesis by a Simple Platinum(II) Terpyridine Derivative", M. Kobayashi, S. Masaoka, K. Sakai, *Angew. Chem. Int. Ed.* **2012**, *51*, 7431-7434.
14. "Photo-Hydrogen-Evolving Molecular Devices Driving Visible-Light-Induced Water Reduction into Molecular Hydrogen: Structure-Activity Relationship and Reaction Mechanism", H. Ozawa, K. Sakai, *Chem. Commun.* **2011**, *47*, 2227-2242 (Feature Article, invited, Hydrogen Issue).
15. "Evidence for Pt(II)-Based Molecular Catalysis in the Thermal Reduction of Water into Molecular Hydrogen", K. Yamauchi, S. Masaoka, K. Sakai, *J. Am. Chem. Soc.* **2009**, *131*, 8404-8406.
16. "The Use of Auophilic and Other Metal-Metal Interactions as Crystal Engineering Design Elements to Increase Structural Dimensionality", M. J. Katz, K. Sakai, D. B. Leznoff, *Chem. Soc. Rev.* **2008**, *37*, 1884-1895.
17. "Homogeneous Catalysis of Platinum(II) Complexes in Photochemical Hydrogen Production from Water", K. Sakai, H. Ozawa, *Coord. Chem. Rev.* **2007**, *251*, 2753-2766.
18. "A Photo-Hydrogen-Evolving Molecular Device Driving Visible-Light-Induced EDTA-Reduction of Water into Molecular Hydrogen", H. Ozawa, M.Haga, K. Sakai, *J. Am. Chem. Soc.* **2006**, *128*, 4926-4927.
19. "New Partially-Oxidized 1-D Platinum Chain Complexes Consisting of Carboxylate-Bridged *cis*-Diammineplatinum Dimer Cations", K. Sakai et al., *J. Am. Chem. Soc.* **2002**, *124*, 12088-12089.

## Zhigang Shuai Biosketch

Zhigang Shuai received his PhD from Fudan University, Shanghai, in 1989. He then worked in the University of Mons, Belgium as a postdoc and then as a research staff scientist with Prof. Jean-Luc Brédas. Since 2000, he became a Hundred-Talent Program professor in the Institute of Chemistry of the Chinese Academy of Sciences based in Beijing. From 2008, he is a Changjiang Scholar Chair Professor in the Department of Chemistry, Tsinghua University in Beijing. His research interests focus on the development of computational methodologies for modeling the electronic processes in organic/polymeric materials. He has devised computational schemes for the radiative and non-radiative decay rates, carrier mobility, thermoelectric conversion, and photovoltaic conversion processes. He has extended the density matrix renormalization group theory and its time dependent formalism for the excited states for conjugated polymers and molecular aggregates. Based on the original computational methods, his team has devised a computational chemistry software MOMAP (abbreviated for MOlecular MATerials Property prediction package), <http://www.momap.net.cn>), which was first released in 2014 and then was commercialized by Shanghai Hongzhiwei Tech Ltd. He has published 409 articles with an H-index 78.

Zhigang Shuai started his IUPAC activity in 2005 by assisting to organize one of the eight technical sessions of the 40<sup>th</sup> IUPAC Congress in Beijing and he attended all the following Council Meetings. He has served as a National Representative in IUPAC CCE (2010-2017), Associate Member (2018-2019) and then Titular Member (2020-2021) for Division I. He has served as a member of IUPAC Organizational Structure Review Group to make recommendations to the 51<sup>st</sup> IUPAC Council Meeting in Montreal, August, 2021.

He was a keynote speaker on “Chemistry and the Progress of Civilization: Example of China” in the UNESCO International Year of Chemistry Launch Ceremony in 2011. He delivered a speech in the Closing Ceremony of the International Year of Periodic Table for Chemical Element in Tokyo, 2019. Since 2008, he has served as a founding and active member of the steering committee for CS3 (Chemical Sciences and Society Summit) organized by the five national chemical societies of China, Germany, Japan, UK, and US.

He was elected to the International Academy of Quantum Molecular Science in 2008 (and became the Vice President in 2018), the Fellow of the Royal Society of Chemistry in 2009, Foreign Member of the Academia Europaea in 2011, the Royal Academy of Belgium in 2013, and the Scientific Board Member of the World Association of Theoretical and Computational Chemists (WATOC) in 2017. He is the recipient of the National Outstanding Young Scientist Award of the National Natural Science Foundation of China (2004), Changjiang Scholar Chair Professorship of the Ministry of Education of China (2008), the Chinese Chemical Society – AkzoNobel Chemical Sciences Award (2012), and the Prix Franco-Chinois of the French Chemical Society (2018). He is the Vice President of the Chinese Chemical Society (2019-2022) responsible for international affairs.

## **Curriculum Vitae**

[zgshuai@tsinghua.edu.cn](mailto:zgshuai@tsinghua.edu.cn), +86-10-62797689, <http://www.shuaigroup.net/>

Family name: Shuai  
First name: Zhigang  
Sex: Male  
Marital Status: Married to Shunan Ma (gave birth to two sons)  
Born: Yanshan County, Jiangxi Province, China, on August 27, 1962  
Nationality: Chinese  
Languages: Chinese (native), French (fluent), English (fluent)  
Address: Department of Chemistry, Tsinghua University, 100084 Beijing, China

### **EDUCATION**

1983: Bachelor's Degree in physics, Zhongshan University, Guangzhou, China  
1986: Master's Degree in solid state physics, Wuhan University, Wuhan, China  
1989: Ph. D. in theoretical condensed matter physics, Fudan University, Shanghai, China

### **PROFESSIONAL EXPERIENCES**

1989, 7 – 1990, 3: Research Fellow, Department of Physics  
Fudan University, Shanghai  
1990, 3 – 2001, 12 Postdoctor and Senior Research Scientist  
Service de Chimie des Matériaux Nouveaux (Jean-Luc Brédas Lab),  
Université de Mons-Hainaut, Mons, Belgium  
2002, 1 – 2008, 4: Full Professor  
Key Laboratory of Organic Solids,  
Institute of Chemistry, Chinese Academy of Sciences  
100190 Beijing, China  
2008, 5 – Present Changjiang Chair Professor  
Department of Chemistry  
Tsinghua University  
100084 Beijing, China

### **HONORS**

2004 Outstanding Young Scientist Award (National Natural Science Foundation of China)  
2008 Changjiang Scholarship Professor (Ministry of Education of China)  
2008 Elected Member of the International Academy of Quantum Molecular Science  
2009 Fellow of the Royal Society of Chemistry (UK)  
2011 Foreign Member of the Academia Euporaea (London)  
2012 Chinese Chemical Society – AkzoNobel Chemical Science Award (2012)  
2013 Foreign Member of the Royal Academy of Belgium (Brussels)  
2017 Scientific Board Member of the World Association of Theoretical and Computational Chemists (WATOC)  
2018 French Chemical Society Prix Franco-Chinois

2018 Elected Vice-President of the International Academy of Quantum Molecular Science

### **IUPAC SERVICES**

- (1) Keynote Speaker, UNESCO International Year of Chemistry Launch Ceremony, January 27, 2011, UNESCO headquarter.
- (2) The 40<sup>th</sup> IUPAC session “Computer in Chemistry” Assistant Chairman, 2005, Beijing
- (3) General Assemblies and Council Meetings of IUPAC 2007 (Torino), 2009 (Glasgow), 2011 (San Juan), 2013 (Istanbul), 2015 (Busan), 2017 (Sao Paolo), 2019 (Paris).
- (4) 2010-2017, National Representative in the Committee of Chemistry Education
- (5) 2018- 2019, Associate Member of Division I.
- (6) 2020-2021, Titular Mamber, Division I.
- (7) 2019-2021, Appointed Member, IUPAC Organizational Structure Review Group
- (8) IUPAC Project “Assessment of theoretical methods for the study of reactions involving global warming gas species degradation and byproduct formation”, No. 2007-048-2-100 (2007 – 2013, Diviosn I), chaired by Prof. Ponnadurai Ramasami.

### **SOCIETAL/EDITORIAL SERVICES**

2019-2022: Vice-President of the Chinese Chemical Society

2011-2022: Elected Member of the Standing Council Committee of the Chinese Chemical Society

2007-2018: Deputy-Secretary General of the Chinese Chemical Society

2015-2018: Chairman of the Theoretical Chemistry Committee of the Chinese Chemical Society

Associate Editor, Acta Chimica Sinica (2012 - )

Editorial Board Member of: National Science Review (CAS), Research, Science Bulletin (CAS), J. Mater. Chem. C (RSC), Theor. Chem. Acc. (Springer), Adv. Theor. Simul (Wiley).

Advisory Board Member of: J. Phys. Chem. (ACS), Chem. Asian J. (Wiley), Nanoscale (RSC), Chem. Phys. Lett. (Elsevier), WIRES Comput. Mol. Sci. (Wiley), ChemPhysChem (Wiley), Nanoscale Advances (RSC).

### **SCIENTIFIC ACHIEVEMENTS**

- (1) Theoretical prediction of higher than 25% spin statistics quantum efficiency for polymer electroluminescence;
- (2) Vibration correlation function formalism for the excited state decay and light-emitting efficiency of OLEDs;
- (3) Quantum Nuclear Tunneling model and computational methods for carrier mobility of organic semiconductors and nanomaterials;
- (4) Quantum chemistry density matrix renormalization group theory
- (5) Principal author of the software MOMAP (<http://www.momap.net.cn>)
- (6) Supervised 27 PhDs
- (7) 409 publications, 20570 citations, H-index 78



30<sup>th</sup> March 2021

Dear Executive Director of IUPAC,

The Chemical Society of Thailand (CST) is very pleased to nominate Professor Dr. Supawan Tantayanont to be a candidate for the IUPAC Vice President which will be elected during the General Assembly 2021.

During the past four decades, Professor Tantayanont has led efforts at several local, national, and international societies and organizations, in various kinds of tasks and activities which involved in IUPAC for over 13 years. These provide a solid foundation from which to launch new ideas, to build more effective collaborations within IUPAC, and to strengthen both existing and new relationships with other scientific organizations and stakeholders, to support the strategic plan of IUPAC.

Enclosed, please kindly see her statement on four vital matters, while maintain and enhance all the continued tasks and activities of IUPAC through Expanding and maintain membership in IUPAC, Engaging young generations to learn science, Fostering the sustainable development and Building the financial strength.

It is indeed the greatest pride of Thailand to nominate Professor Dr. Supawan Tantayanont as the IUPAC Vice President.

Enclosed, please kindly see the information of Professor Dr. Supawan Tantayanont as following:

1. A short statement describing their plans if elected.
2. Nomination letter
3. Abbreviated CV
4. Biographical sketch and photo

It would be very kind if you could consider this nomination and I am looking forward to hearing from you.

With the best regards,

Supa Hannongbua, Professor  
President of the Chemical Society of Thailand

## Supawan Tantayanon (Thailand)

Professor Supawan Tantayanon, the Former Presidents of Polymer Pacific Federation (2002-2003) and Federation of Asian Chemical Societies (2011-2013), was tasked with establishing the first college of Chulalongkorn University in 1987, on petrochemical industry which was new to Thailand at the time. She was later a consultant of some petrochemical companies (1989-2000) which made her realized the importance of chemical safety and the integration of chemistry, business, and society. It influenced her teaching and research interest so much that her focus shifted to “greener” and “application-driven” chemistry. She initiated and constructed three more new academic programs aimed at applied chemistry, the transformation of science and technology to innovation, and this year on “Green Chemistry and Sustainability”.

Professor Tantayanon is interested in small-scale chemistry since 2000, firstly to solve the problems on the high risk of chemical exposure to students in the laboratory. Later she invented the complete set of portable organic chemistry laboratory, “Small-Lab Kit”, holding four Thai patents. She is also the authors of the books “Organic Chemistry Laboratory Based on Chemical Safety and Pollution Minimization (in Thai)”, a chapter “Microscale Organic Experimentations Using Small-Lab Kit” in the book “Microscale Chemistry Experiments for All Ages”, and the book entitled “Small Scale Laboratory: Organic Chemistry at the University Level”, available on the UNESCO website since 2009. In addition, she is the co-author of the book “Chemical Laboratory Safety and Security: A Guide to Developing Standard Operating Procedures”, The National Academies Press, USA available since 2016.

She held numerous national and international positions, including the Coordinator of ACS Green Chemistry Institute (Thailand Chapter) (2002-2006), and the Advisory Board member of UNIDO-Yale Global Green Chemistry Initiatives (2018-2020). Currently she is the Presidents of the Council of Science and Technology Professionals of Thailand, the Science Society of Thailand under the Patronage of His Majesty the King.

Professor Tantayanon was the plenary speakers at 5 various international conferences, conducted more than 100 workshops on small-scale chemistry, green chemistry, and chemical safety in various countries. She has received several awards, including 2018 IUPAC CCE Distinguished Contribution to Chemistry Education and 2021 IUPAC Distinguished Women in Chemistry or Chemical Engineering.

Professor Tantayanon has been active in IUPAC for over 10 years, attending IUPAC GA and Council meetings since 2007, involving with several IUPAC Divisions as a national representative and currently served as a member of the Standing Committee on Chemistry Education and the Interdivisional Committee on Green Chemistry for Sustainable Development. She also actively involved in several IUPAC programs: IYC in 2011, YAC in 2014, and GWB since 2010. Furthermore, she served as the Chairs of MACRO2014 and the 8th ICGC in 2018, as well as members of the IUPAC Task Group of the project No. 2012-009-1-020, and currently the project No. 2020-010-2-020.

## CV of SUPAWAN TANTAYANON

Birth: November 3, 1951, Rajchaburi, Thailand  
Marital Status Married, two sons.

### **Education**

1973 B.Sc. honor (Chemistry), Chulalongkorn University  
1975 M.Sc. (Organic Chemistry), Mahidol University  
1982 Ph.D. (Organic Chemistry), Worcester Polytechnic Institute, USA  
1993 Diploma (Polymer Science), Ferrara University, Italy

### **Academic Positions**

1975-1983 Instructor, Department of Chemistry, Faculty of Science, CU.  
1983-1990 Assistant Professor, Department of Chemistry, Faculty of Science, CU.  
1990-2012 Associate Professor, Department of Chemistry, Faculty of Science, CU.  
1997-2012 Affiliate Associate Professor, Worcester Polytechnic Institute, USA  
2009-2013 Adjunct Professor, University of Regina, Canada  
2012-present Professor, Department of Chemistry, Faculty of Science, CU.

### **Administrative Positions in Chulalongkorn University**

1985-1990 Director, Graduate Multidisciplinary Program on Petrochemical and Polymer Science and Technology, Graduate School.  
1986-1989 Founding Director, Petroleum and Petrochemical College.  
1997-2000 Vice Chair for Planning and Development, Department of Chemistry.  
2000-2003 Vice Chair for Research Affairs, Department of Chemistry.  
2003-2007 Associate Dean, Faculty of Science.  
2007-2012 Director, Technopreneurship and Innovation Management Program.

### **Positions Held (International)**

1999-2001 Vice President, Pacific Polymer Federation  
2002-2003 President, Pacific Polymer Federation  
2002-2006 Coordinator, ACS Green Chemistry Institute (Thailand Chapter).  
2003-present Member, the Editorial Board of Polymer International, John Wiley & Son.  
2006-2007 Co-director of Low-cost Instrumentation and Microscale Chemistry, FACS.  
2007-2009 Director of Low-cost Instrumentation and Microscale Chemistry, FACS.  
2009-2011 President-Elect, Federation of Asian Chemical Societies (FACS)  
2009-2012 Thailand Representative, IUPAC.  
2010-2013 Director, The Asian Regional Center of Chemical Safety and Security under the collaboration of Sandia National Laboratory, USA and Faculty of Science, Chulalongkorn University  
2011-2013 President, Federation of Asian Chemical Societies (FACS)  
2011-2018 Member, Asian Chemistry editorial Societies (ACES), Wiley  
2011-2013 Member, Committee on Chemical Nomenclature and Structure Representation Division, IUPAC  
2013-2015 Member, Committee on Chemistry and Environmental Division, IUPAC.  
2013-2015 Immediate Past President, Federation of Asian Chemical Societies (FACS)  
2013-present Member, Standing Committee on Chemical Education, IUPAC.  
2016-2019 Project Coordinator, Federation of Asian Chemical Societies (FACS)  
2017-present Member, IGCS, IUPAC  
2018-2020 Member, Advisory Board of UNIDO-Yale Global Green Chemistry Initiatives

**Positions Held (National)**

1990-2016	Member, Professor Dr Tab Nilanithi Foundation
1995-present	Member, Dr. Preecha and Prapi Amartayakul Foundation
1997-2003	President, Polymer Society (Thailand)
1998	Assistant General Secretary, National Foundation of Promoting of Science and Technology
1998-2001	President, Chemical Division, Science Society of Thailand.
2001-2006	Vice President, Chemical Society of Thailand
2002-present	Director, Small Scale Chemistry Center, Chulalongkorn University
2003-2017	Vice President, Science Society of Thailand.
2004-2014	Member, Distance Learning Foundation.
2007-2012	President, The Chemical Society of Thailand.
2007-2010	Member, the Safety Committee of National Synchrotron Light Research Institute (Public Organization)
2007-2012	Chairperson, The Chemistry Olympiads Sub-Committee, The Institute for the Promotion of Teaching Science and Technology
2010-2019	Member, the National Hazardous Chemical Committee, Thailand
2011-2013	Member, the Chemical and Consumer Laboratory Accreditation Committee, Thai Industrial Standards Institute, Thailand.
2013-2017	Member, Council of Science and Technology Professionals.
2013-2017	Chair, Sub- Committee of Science and Technology Professionals in Hazardous Chemical Manufacture, Control and Management, Council of Science and Technology Professionals.
2017-present	President, The Council of Science and Technology Professionals of Thailand
2017-present	Member, the Trade Secrets Board, Department of Intellectual Property, Ministry of Commerce.
2020-present	President, The Science Society of Thailand

**Honours, Awards and Scholars**

1977	Fulbright grantee
1979	Phi Lambda Upsilon, Beta Zeta Chapter, USA
1980	Sigma Xi, USA
2009	Outstanding Alumnus of Faculty of Science, Chulalongkorn University
2011	Women in Chemistry, John Wiley & Sons.
2012	Science Project for Excellence Award, The Senate, Kingdom of Thailand
2013	Honorary Fellow, Singapore National Institute for Chemistry (Worldwide contribution to chemistry)
2013	National Research Council of Thailand scholar
2014	Women Leaders of the Global Chemistry Enterprise, ACS.
2015	International Microscale Chemistry Award.
2015	FACS Fellow, Federation of Asian Chemical Societies.
2017	CST Award for Distinguished Contribution to Chemical Education 2016.
2017	FACS Award for Distinguished Contribution to Chemical Education 2017
2018	2018 IUPAC CCE Distinguished Contribution to Chemistry Education.
2021	2021 IUPAC Distinguished Women in Chemistry or Chemical Engineering.



*Consiglio Nazionale delle Ricerche  
Dipartimento Scienze Chimiche e Tecnologie dei Materiali  
Istituto di Chimica dei Composti Organometallici*

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*Dott. Maurizio Peruzzini  
Associate Research Director*

Rome, March 30<sup>th</sup>, 2021

Dr. Lynn Soby, Executive Director  
IUPAC Secretariat  
PO Box 13757  
Research Triangle Park, NC 27709-3757, USA

**e-mail: [executivedirector@iupac.org](mailto:executivedirector@iupac.org)**

**Subject: Nomination of Prof. Pietro Tundo to IUPAC Bureau**

Dear Dr. Soby, dear Lynn,

It is a pleasure for me, as Chair of the Italian National Adhering Organization of IUPAC, to support the nomination of Prof. Pietro Tundo for the position of Elected Member of the IUPAC Bureau.

Pietro Tundo is an outstanding scientist who showed great commitment at national and international level. He holds an exceptional knowledge of the chemistry sciences and related technologies.

Along all his university and management career, Prof. Tundo took care of connecting basic sciences with social needs through sustainable development; his scientific knowledge in green chemistry, combined with his longstanding and excellent experience and high-level worldwide contacts with international organizations, can greatly facilitate a solid research policy of IUPAC and the development of right and timely decisions.

Tundo's experience as previous IUPAC Board Member can efficiently support and contribute to the development of IUPAC, extending and reinforcing its activities and strengthening the relationships with NAOs. Furthermore, due to his recognised and renowned international activities aimed at pursuing the goal of the sustainable development at the global level. His devoted and continuing work in green chemistry education in favour of Developing Countries is a pivotal evidence of this.

CNR, as IUPAC National Adhering Organization for Italy, firmly supports Prof. Tundo's nomination for election to the IUPAC Bureau: connecting basic sciences, applications and outreach to sustainable development, he can positively contribute to inform the scientific community worldwide towards this goal.

Professor Tundo can actively contribute to decision making process. We are confident that his election will be a great benefit in connecting Council with IUPAC Governing Bodies.

Sincerely yours,

Dr. Maurizio Peruzzini,  
President of the Italian National Commission  
CNR-IUPAC Adhering Organization

## Pietro Tundo's Biographical sketch

Pietro R. Tundo is Professor of Organic Chemistry; retired in 2016.

ORCID: <https://orcid.org/0000-0002-8167-356X> h index 44

Publications: [https://www.unive.it/data/persone/5591778/pubb\\_anno](https://www.unive.it/data/persone/5591778/pubb_anno)

Professor Tundo is a pioneer in research and education on green chemistry. He holds a high international profile and is the foremost academic researcher in the field of reactions of dialkyl carbonates which are inherently safe chemical compounds.

He is author of about 400 scientific publications, 40 patents and about 20 books (h index 44) dealing with organic synthesis with low environmental impact and their sustainable applications. Tundo promoted and coordinated many research projects for Italian Ministry of Research, European Union, NATO, and chemical industries.

He is coordinator of UNESCO-UNITWIN "Green Chemistry Excellence from Baltic Sea to Mediterranean Sea and Beyond" (UNTWIN No. 1225) and holder of the UNESCO Chair on Green Chemistry (UNTWIN No. 731).

Tundo is Member of the Bureau of IUPAC (2020-2021) and Chair of the IUPAC Interdivisional Committee on Green Chemistry for Sustainable Development <https://iupac.org/body/041>.

Tundo was President of IUPAC Division Organic and Biomolecular Chemistry (biennium 2007-2009) and founded the IUPAC International Conferences Series on Green Chemistry (first in Dresden, 2006; the ninth to be held in Athens, 2022).

[https://en.wikipedia.org/wiki/International\\_Conference\\_on\\_Green\\_Chemistry](https://en.wikipedia.org/wiki/International_Conference_on_Green_Chemistry)).

He established the Green Chemistry Post-Graduate Summer Schools (1998 – 2020), sponsored by the EU, UNESCO, NATO and IUPAC. Next Summer school (the 13<sup>th</sup>) will be held on July 2021.

Professor Tundo has given a major contribution to improve chemistry and sustainability, extending the boundaries of his activity to a significant number of countries, including all Europe, Russia, China, Australia, a few countries of Africa, Arab region, as well as USA and South America, by establishing common research and education projects, also involving most important international organizations in this attempt. Connecting basic sciences, applications and outreach to sustainable development, he informed the scientific community towards this goal.

Prof Tundo promoted interdisciplinary research and international cooperation to the achievement of sustainable development through chemistry. On this regard, he is Chair of "Assessment of the Contribution of IUPAC Projects to the Achievement of the United Nations Sustainable Development Goals" (Project No.2020-011-2-041).

He has played major roles in enabling both male and female students from many developing countries to acquire extensive information about Green Sciences, for whom he organised financial support. Through the Summer Schools, they have also forged friendships which have allowed for inter and intra country Sustainable Development and Tundo's pivotal work represents how Sciences can connect people and illustrates a peaceful way of Chemistry for the future.

Emails: [tundop@unive.it](mailto:tundop@unive.it) ; [pierotundo45@gmail.com](mailto:pierotundo45@gmail.com)

## Pietro Tundo's abbreviated CV - March 2021

<https://orcid.org/0000-0002-8167-356X> h-index 44.

<http://www.unive.it/data/persone/5591778>

### Education and History of Employment

- 1989 - present: Ca' Foscari University of Venice (Italy). Professor of Organic Chemistry, retired.
- 2016: Senior Associate Researcher at the Institute for the Chemistry of Organometallic Compounds, CNR. Florence (Italy).
- In the years 1979 - 1983: guest researcher at A&M University, College Station (Texas), Syracuse University (New York) and Clarkson College of Technology, Potsdam (New York).
- Founder and President of the *Green Sciences for Sustainable Development* Foundation, GSSD - <https://www.gssd-foundation.org/>. GSSD is a non-profit organization founded in 2020 with headquarters in Venice.

### Scientific Leader Profile

Professor Tundo is a scientist with a high international profile. He published 400 Papers and 40 Patents, one single-Author book, about 20 Edited books.

He has made substantial improvement in a number of fields of basic chemistry sciences, developing green chemical pathways through new syntheses, new reaction mechanisms and new reaction conditions. His work proves the need of research and innovation for implementing greener and more sustainable routes of the chemical production.

In the last 20 years his research is directed toward carbonate chemistry: dialkyl carbonates (no more synthesized from phosgene) are inherently safe compounds for green syntheses and sustainable applications; the Nominee is the foremost academic researcher having published the greatest number of scientific papers in this field.

Prof. Tundo has directed and coordinated many research collaborations with Academy, international Governmental Organizations (UNESCO, OECD, UNEP, OPCW), and industry.

Over the years Professor Tundo was entrusted with many responsibilities by several institutional bodies, membership of scientific societies, many advisory and editorial boards; he received many honors, institutional responsibilities and was invited to major international conferences.

Here below are reported a few services which seem to be the most relevant in the current context.

- 1993: Professor Tundo has founded and directed the Interuniversity Consortium "*Chimica per l'Ambiente*" (Chemistry for the Environment), INCA, embodying 31 Italian Universities.  
INCA's activities were evaluated by the Italian Ministry of Research suggesting that INCA had the scientific leadership in Italy in the area of "Science and technologies for the sustainable development and governance".
- 2003: he launched and carried out the first Italian course entirely dedicated to women, aiming at strengthening their career advancement on sustainable chemistry in the university. 25 Young researchers attended and concluded their experience with an internship abroad.
- 2005 - 2015: Chairman of MEGREC (Mediterranean Green Chemistry Network). This voluntary association of Green Chemistry Institutions of Mediterranean Countries (Egypt, Italy, Morocco, Tunisia, Algeria, Serbia, Greece and Spain) <http://virgo.unive.it/megrec/> was founded on 2005 and represented by the UNESCO UNITWIN No. 731; in cooperation with MEGREC, this UNITWIN promoted and managed many research and educational projects directed forward sustainable chemistry with many Conferences and Workshops.
- 2018 - present: Coordinator of UNESCO "Green Chemistry Excellence from Baltic Sea to Mediterranean Sea and Beyond" (UNITWIN No.1225).
- UNESCO delegate at the Small Island Developing State (SIDS) Workshop: "Mobilizing science and knowledge systems for the sustainable development of SIDS", Praia, Cabo Verde, 25-26 July 2019.

- 2000: Chairman of the Working Group “Green and Sustainable Chemistry” of the European Association for Chemical and Molecular Sciences, which was upgraded in 2015 into the current EuCheMS Division on Green and Sustainable Chemistry.
- 1996 - 2020: Tundo is Italian Representative to OECD for Sustainable Chemistry OECD's Programme. He organized the first OECD Workshop on Sustainable Chemistry: Venice, 15-17 October 1998. Presently, he is the Italian representative to OECD's Working Party on Risk Management.
- 2016 - present: Tundo was involved and participated in many OPCW meetings, expert groups, workshops with the aim to promote and disseminate the peaceful utilization of Chemistry.
- 2018 - present: Member of the Scientific Board of the International Sustainable Chemistry Collaborative Centre (ISC<sub>3</sub>), Germany.

### Responsibilities in IUPAC

- 2007 - 2009: President of the IUPAC Division III (Organic and Biomolecular Chemistry) - [https://iupac.org/who-we-are/divisions/division-details/?body\\_code=300](https://iupac.org/who-we-are/divisions/division-details/?body_code=300).
- 2016 - 2019: Elected Member of the Bureau of IUPAC.
- 2018 - 2021: Chair IUPAC Interdivisional Committee on Green Chemistry for Sustainable Development – <https://iupac.org/body/041>.
- Chair of 21 IUPAC projects (<https://iupac.org/member/pietro-tundo/>), all focused at sustainability through green and sustainable chemistry. Presently, he is chairing the Project “Assessment of the Contribution of IUPAC Projects to the Achievement of the United Nations Sustainable Development Goals” (2020-011-2-041) [https://iupac.org/projects/project-details/?project\\_nr=2020-011-2-041](https://iupac.org/projects/project-details/?project_nr=2020-011-2-041).
- July 8<sup>th</sup>, 2019: Promoter and Organizer of the Special Symposium: Chemistry Addressing the UN-17 Sustainable Development Goals at IUPAC General Assembly and Congress, Paris.
- 2014-2021: Member of the Jury of the PhosAgro/UNESCO/IUPAC Award on Green Chemistry (<http://www.unesco.org/new/en/natural-sciences/science-technology/basic-sciences/chemistry/green-chemistry-for-life/>)
- 2018-2021: Chair of the Jury of IUPAC/ NHU-Zhejiang International Award for Advancements in Green Chemistry <https://iupac.org/iupac-zhejiang-nhu-international-award>.
- 2006: Professor Tundo established the series of IUPAC International Conferences on Green Chemistry the first of which was held in Dresden (2006) and then in Moscow, Ottawa, Foz de Guazu, Durban, Venice, Moscow, Bangkok (2018). The next one will be in Athens (2022) ([https://en.wikipedia.org/wiki/International\\_Conference\\_on\\_Green\\_Chemistry](https://en.wikipedia.org/wiki/International_Conference_on_Green_Chemistry)),
- 1998: Tundo established the first Green Chemistry Postgraduate Summer School in the world, which brought innovating in science education and has provided more than one thousand of students with a solid foundation in green chemistry. The first 10 Summer Schools were supported by INCA and EU. The 11<sup>th</sup> and 12<sup>th</sup> editions were endorsed by IUPAC. The 13<sup>th</sup> Summer School will be held next Summer in Venice, Italy - <https://www.greenchemistry.school/>. Their Motto is “Sustainability through green chemistry”. These Summer Schools stand out for their interdisciplinarity, not just in the selection of teachers and students (carefully selected in order to have high level classes able to understand the importance of sustainability) but also in the main topics discussed (chemistry, biology, medicine, engineering, physics).
- Tundo proposed and co-organized the first IUPAC sponsored Postgraduate Summer School on Green Chemistry in Africa, that was held in Tanzania, in May 2019. <https://iupac.org/event/iupac-for-africa-postgraduate-summer-school-on-green-chemistry> and <https://www.udsm.ac.tz/web/index.php/colleges/conas/gallery/154/1>

Professor Tundo recognized the importance of educating the next generation of scientists to practice chemistry in a sustainable fashion. His activities are aligned with the U.N. Sustainable Development Goals. Most significantly, Prof. Tundo arranged for many young early career delegates from developing countries to attend the events by providing substantial financial support for this purpose.

**"B.A. Beremzhanov atyndag'y  
Qazaqstandyq ximiyalyq qog'amy"  
Respublikalyq qog'amdyq  
birlestigi**



**Republican public  
association  
"B.A. Beremzhanov  
Kazakhstan Chemical  
Society"**

Qazaqstan, 050040, Almaty, al Farabi  
dan., 71  
Тел. +7-777-224-1952  
E-mail:  
mukhambetkali.burkitbayev@kaznu.kz  
6 Sayir 2021

71, al-Farabi av., Almaty,  
050040, Kazakhstan  
Phone: . +7-777-224-1952  
E-mail:  
mukhambetkali.burkitbayev@kaznu.kz  
April 6, 2021

Professor Christopher M.A.Brett,  
IUPAC President

Dear Professor Christopher M.A. Brett

I'm sending you for your kind consideration the prepared Application form regarding our interest to become as National Adhering Organization of IUPAC.

The Republican public association "B.A. Beremzhanov Kazakhstan Chemical Society" (RPA "KChS") was officially registries at the Ministry of Justices of Kazakhstan in July 21, 2020 y. and includes 10 leading Kazakh universities and several chemical enterprises.

For Kazakh chemists which are representatives of different schools and directions in chemical science entering to the IUPAC would help for further integration of Kazakh scholars into the international chemical community. It will also promote basic objectives of the IUPAC by expanding its activities to the Central Asia region.

As enclose you can find

- (i) A copy of the Statutes & Bylaws of the organization in English.
- (ii) A brief description of the goals of the organization and its significant activities.

Sincerely yours,

Chairman of the Board of the  
RPA "KChS", professor



Mukhambetkali Burkitbayev

## **The goals of Republican Public Association “B.A. Beremzhanov Kazakhstan Chemical Society”**

The Association includes 9 leading universities of the Republic of Kazakhstan.

The goals of Republican Public Association “B.A. Beremzhanov Kazakhstan Chemical Society” (RPA “KChS”) are following:

- rendering comprehensive assistance and assistance to its members in the implementation of their creative, scientific, technical, organizational, production and economic ideas, plans, projects, programs aimed at obtaining new scientific knowledge, enhancement of production, improving the education system, increasing business activity and social economic progress;
- assistance in the organization and implementation of scientific and engineering developments for national and transnational companies, enterprises, associations and other organizations, including the provision of advisory, methodological, expert, scientific and technical, intermediary and other assistance, information and analytical services;
- development and submission in accordance with the established procedure to the legislative and executive authorities of proposals and recommendations for the development of chemical science and industry, protection of the interests of chemists;
- carrying out publishing activities in accordance with the legislation on the mass media, issuing magazines, bulletins, scientific and technical works and other publications of an informational and educational nature;
- organization and holding of competitions, exhibitions, conferences, seminars, symposia, congresses, discussions and other events;
- assistance in the development of curricula and programs for the dual system of training specialists in chemistry and chemical technology and the improvement of the training system in existing educational institutions of the chemical profile, in the improvement of the system of attestation of personnel of educational institutions, considering domestic and foreign experience;
- establishment of personal scholarships and awards for students of chemical specialties and schoolchildren;
- assistance in the creation of information centers on the labor market of professional chemists and on the working conditions provided to them, on human resources in the field of chemistry;
- development of creative and business contacts of members of the Association with scientists, engineers, enterprises, professional, national and international state and public organizations, including the conclusion of contracts for the subcontracting of research and development work by members of the Association;
- creation of conditions for the accumulation of financial and material resources necessary for the implementation of the goals of the Association;
- development of international cooperation in educational, scientific and technical activities.

APPROVED  
by the Constituent Assembly  
of citizens initiators of  
Republican public association  
“B.A. Beremzhanov Kazakhstan  
Chemical Society”

Protocol dated June 10, 2020

## STATUTE

**Republican public association  
“B.A. Beremzhanov Kazakhstan Chemical Society”**



ALMATY  
2021

## **ARTICLE 1. General Provisions. Legal status**

1.1. Republican Public Association “B.A. Beremizhanov Kazakhstan Chemical Society”, hereinafter “Association”, was created as a result of a voluntary association of citizens on the basis of membership in order to achieve the common goals provided for by this Charter.

1.2. Association name:

**in English:**

**full:** Republican Public Association “B.A. Beremizhanov Kazakhstan Chemical Society”;

**abbreviated:** RPA “KChS”.

1.3. The association has republican status. The period of the Association's activity is not limited.

1.4. The association carries out its activities in accordance with the Constitution of the Republic of Kazakhstan, the Civil Code, the Laws of the Republic of Kazakhstan “On public associations” dated May 31, 1996 No. 3-I, “On non-commercial organizations” dated January 16, 2001 No. 142-II and this The Charter on the principles of voluntariness, equality of its members, self-government, legality, accountability and publicity of activities.

1.5. The association has separate property and is responsible for this property for its obligations, on its own behalf through its officials acquires and exercises property and personal non-property rights and obligations, acts as a plaintiff, a defendant and a third party in court, has an independent balance and estimate. Based on the foregoing, the Association is recognized as a legal entity under the legislation of the Republic of Kazakhstan from the moment of its state registration.

1.6. The Association has the rights granted to it by the members of the Association within the framework of the legislation of the Republic of Kazakhstan, and has the attributes necessary for its activities (bank accounts, including currency, seals and stamps, letterheads, trademarks, etc.).

1.7. Location of the Association: 050040, Republic of Kazakhstan, Almaty, Bostandyk district, Al-Farabi avenue, building 71/23, office 214.

1.8. Location of the permanent governing body of the Association: 050040, Republic of Kazakhstan, Almaty, Bostandyk district, Al-Farabi avenue, house 71/23, office 214.

## **ARTICLE 2. Subject and objectives of the Association**

2.1. The subject of the Association's activities is:

- assistance in creating conditions for effective interaction of its members with representatives of legislative and executive authorities, and subjects of the market of scientific and technical services, as well as enterprises of the industrial and production sector of the economy of the Republic of Kazakhstan, the implementation of the scientific and intellectual potential of its members, the development of research in the field of fundamental chemical science and industrial chemistry.

2.2. The purpose of the Association is:

- rendering comprehensive assistance and assistance to its members in the implementation of their creative, scientific, technical, organizational, production and economic ideas, plans, projects, programs aimed at obtaining new scientific knowledge, improving production, improving the education system, increasing business activity and social economic progress;
- assistance in the organization and implementation of scientific and engineering developments for national and transnational companies, enterprises, associations and other organizations, including the provision of advisory, methodological, expert, scientific and technical, intermediary and other assistance, information and analytical services;
- development and submission in accordance with the established procedure to the legislative and executive authorities of proposals and recommendations for the development of chemical science and industry, protection of the interests of chemists;
- carrying out publishing activities in accordance with the legislation on the mass media, issuing magazines, bulletins, scientific and technical works and other publications of an informational and educational nature;
- organization and holding of competitions, exhibitions, conferences, seminars, symposia, congresses, discussions and other events;
- assistance in the development of curricula and programs for the dual system of training specialists in chemistry and chemical technology and the improvement of the training system in existing educational institutions of the chemical profile, in the improvement of the system of attestation of personnel of educational institutions, taking into account domestic and foreign experience;
- the establishment of personal scholarships and awards for students of chemical specialties and schoolchildren;
- assistance in the creation of information centers on the labor market of professional chemists and on the working conditions provided to them, on human resources in the field of chemistry;
- development of creative and business contacts of members of the Association with scientists, engineers, enterprises, professional, national and international state and public organizations, including the conclusion of contracts for the subcontracting of research and development work by members of the Association;
- creation of conditions for the accumulation of financial and material resources necessary for the implementation of the goals of the Association;
- development of international cooperation in educational, scientific and technical activities.

### **ARTICLE 3. Rights and obligations of the Association**

3.1. The Association acquires rights and assumes responsibilities through its governing bodies, acting within the powers provided by this Charter and the legislation of the Republic of Kazakhstan.

3.2. For the implementation of the statutory goals, the Association in the manner prescribed by the legislation of the Republic of Kazakhstan has the right:

3.2.1. to disseminate information about their activities;

- 3.2.2. to represent and defend the rights and legitimate interests of its members in courts and other state bodies, other public associations;
- 3.2.3. to establish mass media;
- 3.2.4. to carry out publishing activities;
- 3.2.5. to join international non-profit non-governmental associations;
- 3.2.6. to carry out entrepreneurial activity insofar as it serves to achieve the statutory goals;
- 3.2.7. to exercise other powers that do not contradict the legislation of the Republic of Kazakhstan.
- 3.3. The association is obliged:
- 3.3.1. to comply with the legislation of the Republic of Kazakhstan, as well as the norms provided for by the Charter;
- 3.3.2. to provide its members with the opportunity to familiarize themselves with documents and decisions affecting their rights and interests;
- 3.3.3. to inform its members about the receipt and expenditure of money;
- 3.3.4. to inform the registering authority about changes in the location of the permanent governing body and data on managers in the amount of information included in the National Register of Business Identification Numbers.

#### **ARTICLE 4. Membership, acquisition and loss procedure**

- 4.1. Members of the Association may be state, public and other organizations - legal entities operating in the field of chemistry and chemical technology, chemical education and production of chemical products, with the exception of political parties and trade unions, as well as individuals who recognize and fulfill the Charter of the Association, decisions of the governing bodies of the Association that paid membership fees.
- 4.2. Membership in the Association is voluntary. Organizations or individuals wishing to join the Association, submit an application for membership in the Association to the Chairman of the Board of the Association. Applicants for admission to the Association may be denied due to the lack of conditions imposed on the members of the Association in Paragraph 4.1 of this Charter, as well as if the activities carried out by them contradict the statutory goals of the Association. The members of the Association have equal rights and equal responsibilities.
- 4.3. The members of the Association have the right:
- to get acquainted with the constituent documents of the Association;
  - to be elected to the governing bodies of the Association;
  - to use data banks in libraries and other information sources of the Association;
  - voluntarily to resign from the membership of the Association;
  - to receive information about the receipt and expenditure of money of the Association by familiarizing with the annual reports of the executive and control body at the Congresses of the Association;
  - to participate independently and / or through their authorized representatives in the work of the Congress of the Association;
  - to make proposals on amendments and additions to the Charter;

- to apply to the Board and structural divisions of the Association for advisory, expert and other legal assistance;
- to submit for consideration by the Board of the Association, proposals on the activities of the Association and participate in their implementation;
- to receive information about the events planned by the Association and take part in them;
- to comply with ethical standards in daily activities, to prevent actions that damage the authority and business reputation of the Association.

4.4. A member of the Association is obliged:

- to comply with the requirements of this Charter;
- to comply with the decisions of the Association's management bodies;
- to participate in the life of the Association, to promote the goals, subject matter and role of the Association, to involve new members;
- actively participate in the work of the branches / representative offices of the Association;
- pay membership fees regularly.

4.5. Withdrawal from the members of the Association is carried out by submitting a written application to the Chairman of the Management Board of the Association, not later than one month before leaving.

4.6. The decision to withdraw a Member of the Association is made by the Congress of the Association. The date of the decision is considered the release date.

4.7. Before the Congress of the Association makes a decision on the withdrawal of a member of the Association from the membership of the Association, need to fulfill the previously assumed obligations in relation to the Association.

4.8. The expulsion from the members of the Association is made by the decision of the Congress of the Association. The grounds for exclusion are a systematic violation of their duties by a member of the Association, non-observance of ethical norms, damage to the Association, including its business reputation, the death of a member of the Association.

The decision on exclusion can be appealed against in court, provided for by the legislation of the Republic of Kazakhstan.

4.9. The change of members of the Association is carried out annually upon payment of the next membership fees. Members of the Association who have refused to pay their regular membership fees within the established deadlines two times in a row are considered to have retired from the membership of the Association.

## **ARTICLE 5. Management and control bodies of the Association**

5.1. The governing bodies of the Association are:

- Congress of the Association - the Supreme body;
- Management Board of the Association - a collegial executive body headed by the Chairman of the Management Board of the Association;
- The Revision Commission is a supervisory body.

**Union Congress:**

5.2. The supreme governing body of the Association is the Association Congress. The Congress of the Association is convened by the Chairman of the Presidium of the Association at least once a year.

5.2.1. The convocation, date, agenda and place of the meeting of the Congress of the Association are announced by the Chairman of the Management Board of the Association not later than one month before its convocation.

5.3. The exclusive competence of the Congress of the Association includes:

5.3.1. adoption, amendments and additions to the constituent documents of the Association;

5.3.2. voluntary reorganization and liquidation of the Association;

5.3.3. determination of the priority directions of the Association's activities, the principles of the formation and use of its property;

5.3.4. determination of the competence, organizational structure, procedure for the formation and termination of the powers of the management bodies of the association;

5.3.5. appointment and dismissal of members of the Audit Commission, the Management Board of the Association and the Chairman of the Management Board of the Association;

5.3.6. determination of the procedure and frequency of submission of financial statements by executive bodies, as well as the procedure for conducting an audit by the control body and approval of their results;

5.3.7. consideration of complaints from members of the Association against the actions of the governing and supervisory bodies of the Association;

5.3.8. consideration, in the order established by the legislation of the Republic of Kazakhstan, of materials for awarding and conferring titles to members of the Association, at the suggestion of the Chairman of the Presidium of the Association;

5.3.9. making a decision on the participation of the Association in legal entities, as well as the creation of branches and / or representative offices of the Association.

5.4. The congress of the Association is considered competent if attended by at least two thirds of the members of the Association or their representatives.

5.5. The decisions of the Congress of the Association are taken by open or closed voting by a simple majority of votes of the participants of the Congress of the Association. Decisions on amendments and additions to the founding documents of the Association and on the termination of the activities of the Association are made by two-thirds of the votes of the members of the Association present at the Congress.

5.6. An extraordinary meeting of the Congress of the Association may be convened by the decision of the Chairman of the Management Board of the Association, the Audit Commission, or at the request of at least fifty percent of the total number of members of the Association, expressed in writing.

5.7. The work of the meeting of the Congress of the Association is supervised by the Chairman of the Board, the Protocol of the meeting of the Congress of the Association is kept by the secretary, who is elected in working order.

**Chairman of the Board of the Association:**

5.8. The Chairman of the Management Board of the Association is the sole executive body of the Association and is accountable to the Congress of the Association and the Management Board of the Association. The Chairman of the Board of the Association is elected by the Congress of the Association for a term of five years from among the members of the Association. The Chairman of the Board of the Association manages the activities of the Association in the period between the Congresses of the Association.

5.9. Chairman of the Board of the Association:

5.9.1. manages the current activities of the Association within the framework of the approved projects and programs of the Association and the implementation of the decisions of the Congress of the Association;

5.9.2. convenes and prepares questions for consideration at the Congress of the Association;

5.9.3. develops and submits for consideration to the Congress of the Association programs and projects of activities of the Association;

5.9.4. approves the plan of public events of the Association;

5.9.5. develops and approves instructions and regulations, structure, staff, cost estimates for the maintenance of the Association's employees, recruits and dismisses employees of the Association in accordance with the staffing table;

5.9.6. develops proposals on the submission of amendments and additions to the Charter of the Association for consideration by the Congress of the Association;

5.9.7. presents to the Congress of the Association a report on its activities, bears responsibility before the Congress of the Association for the results of the financial and economic activities of the Association;

5.9.8. approves the cost and income estimates of the Association;

5.9.9. makes other decisions related to the activities of the Association, with the exception of issues attributed to the exclusive competence of the Congress of the Association.

5.9.10. represents the interests of the Association in state and public organizations, concludes contracts, agreements and agreements on behalf of the Association, represents the Association in relations with other legal entities;

5.9.11. opens accounts of the Association in banks, has the right of the first signature on financial documents;

5.9.12. acts on behalf of the Association without a power of attorney;

5.9.13. disposes of the property of the Association;

5.9.14. issues orders that are binding on the employees of the Association;

5.9.15. prepares, in the manner prescribed by the legislation of the Republic of Kazakhstan, materials for awarding and conferring titles to creative individuals, athletes, coaches, to present them to the Congress of the Association;

5.9.16. decides other issues of the Association's activities that are not within the exclusive competence of the Association's Congress.

5.10. The Chairman of the Board of the Association may be relieved of his post by the decision of the Congress of the Association.

5.11. The Chairman of the Board of the Association has the right to refuse to perform his duties at any time, notifying the Congress of the Association in writing two months before the actual refusal.

**Audit committee:**

5.12. To control the financial and economic activities of the Association, the Congress of the Association elects from among the members of the Association an Audit Commission in the amount of three people, for a period of five years. The Audit Commission is headed by the Chairman from among the members of the Audit Commission, determined by the Congress of the Association. The Audit Commission is accountable to the Congress of the Association.

5.13. The Audit Commission checks the financial activities of the Association at least once a year and submits reports on its work for approval to the Congress of the Association. The Audit Commission has the right to conduct extraordinary inspections and, based on their results, demand an extraordinary convocation of the Association's Congress.

5.14. The Chairman of the Management Board of the Association cannot be a member of the Audit Commission at the same time.

5.15. The procedure for the activities of the Auditing Commission is determined by the Charter approved by the Congress of the Association. The Audit Commission has the right to involve professional auditors and experts in its work on a paid and free basis.

**ARTICLE 6. Property of the Association**

6.1. The property of the Association consists of material values and financial resources on the balance sheet of the Association. The property of the Association may be objects necessary for the material support of the activities provided for by this Charter, with the exception of objects prohibited by the legislation of the Republic of Kazakhstan.

6.2. The source of the Association's property is:

6.2.1. entrance, annual membership and targeted fees of the members of the Association;

6.2.2. voluntary contributions and donations from various organizations and individuals in various forms;

6.2.3. funds received from the implementation of contracts for statutory purposes;

6.2.4. targeted funding (grants) from donor organizations;

6.2.5. receipts from lectures, exhibitions, conferences and other events held by the Association;

6.2.6. income from permitted entrepreneurial activities;

6.2.7. other funds and receipts not prohibited by the current legislation of the Republic of Kazakhstan.

6.3. The association can carry out entrepreneurial activity insofar as it serves to achieve its statutory goals. The business activities of the Association are carried out in accordance with the legislation of the Republic of Kazakhstan. The income

from the entrepreneurial activity of the Association is subject to taxation in accordance with the legislation of the Republic of Kazakhstan.

6.4. The income from the entrepreneurial activity of the Association cannot be redistributed among the members of the Association and must be used to achieve its statutory goals. The association can use its funds for charitable purposes.

6.5. The members of the Association have no rights to the property transferred by them to it.

6.6. Members of the Association are not responsible for its obligations, and the Association is not responsible for the obligations of its Members.

### **ARTICLE 7. Branches and Representative Offices of the Association**

7.1. The Association can open branches and representative offices operating within the Republic of Kazakhstan, in accordance with the legislative acts of the Republic of Kazakhstan.

7.2. Branches or representative offices of the Association are not independent legal entities. The branch or representative office of the Association is endowed with the property of the Association and acts on the basis of the Regulations approved by the Congress of the Association. The property of a branch or representative office of the Association is recorded on a separate balance sheet and on the balance sheet of the Association. The branch or representative office of the Association independently disposes of the property of the Association transferred to it, unless otherwise specified in its Regulations.

7.3. The decision to establish a branch or representative office is made at the Congress of the Association. At the same time, the Congress of the Association approves the Regulations on the branch or representative office.

7.4. The election and dismissal of the heads of the branches or representative offices of the Association is carried out by the Congress of the Association in accordance with the current legislation of the Republic of Kazakhstan.

7.5. A branch or representative office of the Association operates on behalf of the Association. The Association bears responsibility for the activities of a branch or a representative office of the Association.

7.6. Branches or representative offices of the Association are subject to record registration, and in the event of a name change - re-registration. The procedure and terms of record registration (re-registration) are determined by the legislation of the Republic of Kazakhstan on state registration of legal entities and record registration of branches and representative offices.

7.7. The decision to liquidate a branch or a representative office of the Association is made by the Congress of the Association.

### **ARTICLE 8. Financial year and reporting**

8.1. The financial year of the Association is equal to the calendar year.

8.2. Accounting and financial reporting are kept in the manner prescribed by the current legislation of the Republic of Kazakhstan.

### **ARTICLE 9. Procedure for making changes and additions**

### **to the Charter of the Association**

9.1. Changes or additions to this Charter can only be made by the Congress of the Association, if at least two thirds of the members of the Congress of the Association are present.

9.2. Changes or additions to the Charter are considered accepted if at least two-thirds of the members of the Association present voted for them. The form of voting is established by the Congress of the Association.

9.3. Each member of the Association has the right to make proposals on changes or additions to the Charter of the Association. The Chairman of the Board of the Association has the right, on his own initiative, to make proposals for changes or additions to the Charter of the Association.

### **ARTICLE 10. Reorganization and liquidation of the Association**

10.1. The termination of the activities of the Association is carried out in the form of reorganization or liquidation in the manner prescribed by the legislative acts of the Republic of Kazakhstan.

10.2. The reorganization of the Association (merger, acquisition, division, separation, transformation) is carried out by decision of the body of the public association in the manner prescribed by this Charter and the legislation of the Republic of Kazakhstan. When the Association is reorganized, its rights and obligations are transferred to its successors.

10.3. The association is considered reorganized, with the exception of cases of reorganization in the form of a merger, from the moment of state registration of the newly formed organization (organizations).

10.4. When the Association is reorganized in the form of another organization joining it, the first of them is considered reorganized from the moment the information on the termination of the affiliated organization is entered into the National Register of Business Identification Numbers.

10.5. State registration of an organization (organizations) newly emerged as a result of reorganization and entry into the National Register of business identification numbers of information on the termination of activities of the reorganized organization (organizations) are carried out in the manner prescribed by the legislation of the Republic of Kazakhstan on state registration of legal entities and record registration of branches and representative offices.

10.6. The association is liquidated:

- by decision of the Congress of the Association;
- by a court decision, as well as in other cases used by the legislation of the Republic of Kazakhstan,
- to the legislative acts of the Republic of Kazakhstan in the manner prescribed by the legislative acts of the Republic of Kazakhstan.

10.7. Liquidation of the Association is carried out on the grounds and in the manner prescribed by the legislation of the Republic of Kazakhstan.

### **ARTICLE 11. Property of the liquidated Association**

11.1. In the event of the liquidation of the Association, the property remaining after the satisfaction of the creditors' claims is directed to the purposes specified in this Charter, unless a different procedure is provided for by legislative acts.

11.2. If the Association used tax and other benefits and existed on contributions from members and (or) founders, income from its activities, donations to the public, received grants from the state or non-governmental organizations, the property left after liquidation after settlements with creditors cannot be redistributed among the members, founders, officials or employees of the Association, but must be used in accordance with this Charter for the statutory purposes of the Association or, by decision of the Congress of the Association, transferred to a non-profit organization pursuing the same or similar goals as the liquidated Association.

**Chairman of the Board of the Republican Public Association  
“B.A. Beremzhanov Kazakhstan Chemical Society”**

**Burkitbaev Mukhambetkali**

<hr/>	
(full name)	/ (signature)



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

### **7 Statutory Report of the President on the State of the Union Professor Christopher Brett**

The Statutory Report of the IUPAC President is described in Statute 6.23: “The president shall submit to each regular meeting of the Council a report on the general state of the Union.” Thus, this report will give an overview of the challenges and accomplishments during the last biennium. Not all activities will be mentioned as further details can be found in later agenda items, the reports from the other officers, from the divisions and from the standing committees.

Two years ago, in 2019, we celebrated IUPAC’s centenary and the International Year of the Periodic Table of the Chemical Elements. Many activities besides the normal ones, particularly those of IYPT, took place throughout the year (IYPT). The final IYPT event was a closing ceremony in Tokyo, Japan in December 2019.

The last regular Council meeting took place in Paris in July 2019, in the middle of the celebrations; the General Assembly and World Chemistry Congress had special sessions to mark both the centenary and IYPT. Apart from the celebrations themselves we were focussing on the vision of how IUPAC should evolve to continue to be, as stated in our Strategic Plan, a global indispensable resource of chemistry. We were discussing how to implement the legacy of these activities, how to increase IUPAC’s visibility and outreach, involve more countries and achieve more industrial representation. There was a general opinion for the need to adapt our working practices to the changing world and procure the best ways of doing so, whilst ensuring our future sustainability as an organisation. Following the recommendation of the Executive Committee, Council approved a motion to undertake a complete review of the organizational structure of IUPAC, to be used as a basis towards an agile and responsive IUPAC governance structure and mode of action, with widespread global reach, setting the scene and future for IUPAC’s second century. The ways in which we were going to implement these goals, speaking with a common voice, were being mapped out. Meanwhile, in order to address the question of short-term financial sustainability, it was decided to do more of our activities on-line by videoconference and other tools in the 2020-21 biennium, in this way reducing expenses as well as our carbon footprint.

Then, at the beginning of 2020, just after the start of my presidential term, came the Covid-19 pandemic, the world changed and the day-to-day lives of us all were altered drastically. The world went into lockdown, most chemical industry shut down. At the same time the air became cleaner and humanity in general realised the huge impact that we have on the natural world. It demonstrated how fragile everything is with respect to what are regarded as our needs and that we take for granted. We are still moving to what is often designated as a “new normal”, where some



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of the face-to-face in-person interactions will return but remote virtual meetings and conferences will almost certainly play a greater part than before. IUPAC has responded well to the challenge.

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### Committees

The division and standing committees have been carrying out a lot of work under difficult circumstances, as explained later in the agenda, and this is in itself an important accomplishment. It had already been decided that some of the meetings, such as the yearly Bureau meetings should take place on line. So the mechanisms for virtual meetings were in place. The effect on the off-year meetings of the Divisions and Standing Committees was greater, as these were often used as brain-storming meetings to identify where action from IUPAC, as a leader, could help in our mission to develop a common language, exchange of scientific information and to foster sustainable development. Each committee developed its own strategy to deal with the problems arising from the pandemic and turn them into opportunities, in some cases organising monthly virtual meetings. Guidelines for efficient project management had already been improved in the previous biennium and this helped towards a lot of work being done on existing projects; however, the number of new projects has been small. Whilst this is a not-unexpected consequence of the pandemic it is important that it does not continue.

The virtual General Assembly has been planned to take place mostly in the week before the virtual World Chemistry Congress, and without overlap between the various committee meetings. Thus, opportunities for interaction between the different committees with identification of common goals are enhanced which is certainly an advantage, despite the obvious limitations from time zone differences. This cross fertilisation which is also fostered by the interdivisional committees with respect to chemical industry, education, cheminformatics, green chemistry, world needs and nomenclature aspects should lead to tangible benefits in the near future.

### Governance and virtual meetings of Council

You are all aware of the steps that have been taken following receipt by the Executive Committee of the review group report on organizational structure in November 2020. We are very grateful to the review group for the tremendous amount of work and effort that they put into preparing this report. The report and the proposed changes to governance, discussions on which you are all involved, are the subject of a later agenda item. Key to the future are finding how best to focus on science and scientific strategy, how to reduce the complexity of our organisation and ensure financial sustainability now and in the mid-term and long-term future. The pandemic has given us



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a short breathing space owing to the Union's almost-zero expenses with travel and accommodation to attend meetings but these crucial questions have to be addressed and answered now, and cannot be postponed.

Our Statutes and Bylaws were conceived for in-person meetings, an explicit requirement for Council meetings. It was clear by the middle of last year that this needed to be changed for us to be able to continue to function. A special virtual Council meeting, allowed by a Covid-19 dispensation under Swiss law, was held on 5<sup>th</sup> May 2021 in order to make changes to the Statutes and Bylaws. The unanimous approval of the changes by Council means that henceforth we will be able to conduct all our business that requires decisions at Council level, in-person, which is the preferred for the General Assembly, in hybrid form or in virtual format and we can use electronic voting. This enables us to continue with our activities and brings us into line with other similar international organisations. Thank you all for your support of this change.

### Conferences, publications and digital standards

The 2021 World Chemistry Congress, that was previously scheduled to take place in Montreal is now in virtual format; the final decision was taken in January 2021 and the evolution of the pandemic since then has shown that, unfortunately, it was the correct decision. The organisation of the Congress by the Canadian Society for Chemistry has carried on, and I would like to thank all those who have made this possible. This is an excellent example of how a problem can be turned into new opportunities with many more symposia taking place than would otherwise have been possible. The World Chemistry Leadership Meeting will also go around the world in a virtual sense.

Clearly, one area in which activity has been very little is that of IUPAC-endorsed conferences. These have been cancelled or delayed until 2022, when we hope that they can take place in-person or in hybrid mode. In a few cases, symposia were held in totally virtual mode. Issues of our journal, Pure and Applied Chemistry (PAC), are normally devoted to the proceedings of these conferences; in their place until the situation is normalised there will be topical theme issues to showcase the latest achievements in the chemical sciences. PAC also gives a forum for the winners of some of our prestigious award programmes. For example, in December 2020 there was a special issue with articles written by a selection of the winners of the IUPAC-Solvay awards since the International Year of Chemistry in 2011. It was designed to coincide with the 60<sup>th</sup> anniversary, the diamond jubilee, of PAC. The purpose of Pure and Applied Chemistry, to publish recommendations and technical reports plus the proceedings of high-level scientific IUPAC-endorsed conferences, dates right from the beginning; it has served IUPAC well. Chemistry International and Chemistry Teacher International have continued to be an excellent avenue to inform about our projects and



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activities to IUPAC members and to the chemistry community, although it would benefit from increased external visibility, an issue which is being addressed.

The digital revolution that has been taking place in recent years and how to deal with the ever increasingly large amount of data that is being generated, how to classify it and how to unambiguously identify the fast-growing number of chemical compounds clearly falls within our broad remit of a common language and free exchange of scientific information. Significant efforts are being made to address these issues and IUPAC is taking a leading role in examining the questions that arise.

### Legacy activities of the centenary/IYPT and the IYBSSD

Several activities that are associated with our Centenary celebrations and the IYPT, have formed a legacy looking forward to the future and are being continued. The first of these is the Global Women's Breakfast (GWB), that initially took place in 2011 in the International Year of Chemistry, was relaunched in 2019 for the IUPAC Centenary, took place in 2020 and 2021, and is planned to continue every year in the future. It has been a tremendous success and has made full use of the opportunities afforded by in-person and by on-line meetings. The second is a continuation, in a slightly different way and with new questions, of the highly popular Periodic Table Challenge, version 2 of which was launched in June 2020. This time it has been translated into several other languages and has attracted thousands more players. The competition for the ten best emerging technologies has been particularly pertinent, and has continued in 2021 in its third edition.

The proposed International Year of Basic Sciences for Sustainable Development (IYBSSD) in 2022, approved by UNESCO in November 2019, coordinated by the International Union of Pure and Applied Physics (IUPAP) and of which IUPAC is a founding partner, will aid us in promoting the basic, fundamental, sciences of which chemistry is crucial, as underpinning the important applications which are offered to society and often taken for granted, as well as chemical outreach activities for young people. Submission of the resolution request for proclamation to the UN in the 2020 General Assembly was not possible owing to limitations caused by the pandemic, and will occur in September 2021, so a 6-month delay to the start date, to July 2022, will be requested. IUPAC's activities will include the legacy activities from the centenary. This will be an excellent opportunity, that we cannot miss, to demonstrate the importance of chemistry together with the other basic sciences. All Council members and other chemical and other scientific societies are also encouraged to organise activities at national and regional level.



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### International Organisations

We have been involved in the activities of the International Science Council, ISC, in various ways. Following completion of the ISC gender gap project a number of the Unions involved have become Founding Partners for the establishment of a Standing Committee for Gender Equality in Science, Technology, Engineering and Mathematics (SCGES). We have been discussing, amongst other things, scientific publishing strategies and the conduct of science in the future.

IUPAC is particularly proud to have received a 2019 Hague Award from the Organisation for the Prohibition of Chemical Weapons (OPCW) in November 2019, which recognises not only our collaboration with OPCW over many years but also our promotion of the peaceful uses of chemistry. OPCW is represented on a number of our committees and are strengthening our cooperation, particularly in relation to outreach and capacity building.

Our established contacts and interactions with other international organisations are continuing well and new ones are being sought. A list of our representatives on these organisations can be found in the website.

### Centenary Endowment Fund and new Standing Committees

IUPAC is now finally in a position to launch the Centenary Endowment Fund, all administrative questions have been addressed and IUPAC has been granted the necessary status under the IRS rules in the USA, in order to be able to receive donations. This is an important accomplishment. Under our current structure, the Centenary Endowment Board needs to exist as a Standing Committee that we are asking Council to create. A second new standing committee, the Committee for Ethics, Diversity, Equity and Inclusion (CEDEI) is also being asked for, requested by the working groups of the Bureau during their analysis of the organizational structure review group report, and is in line with similar committees that are being created in other organisations.

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In summary this has been a biennium that was very different from what was predicted two years ago. There have been challenges and accomplishments. IUPAC has continued its activities, and has started new ones. We are on the path to changing the governance structure that will enable us to be more agile and efficient and better achieve our scientific objectives.

I thank all the expert volunteers in all the committees and task groups and in our other initiatives, for giving freely of your time and expertise to IUPAC in order to further our mission for a common



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language in chemistry, free exchange of data, fostering sustainable development and other challenges that arise, that demonstrate the importance and crucial nature of chemistry, the central science.

It has been a privilege to serve the Union as President. All that we have done has been very much a team effort. Many have had to rise very early or retire very late at night for our on-line meetings. The officers have been regularly holding virtual meetings during this biennium: I would like to thank Javier Garcia-Martinez, Qi-Feng Zhou, Richard Hartshorn, Colin Humphris for our constructive discussions and actions which have helped IUPAC navigate through this rather unstable period. I also thank all members of the Executive Committee and Bureau, who have all been asked to go well beyond what would normally be expected, with many more virtual meetings than normal and sometimes at rather unreasonable hours. These have been crucial for continuing our work and also in discussing, through working groups, the best way to respond to the question of how to formulate needed changes to the governance structure. Extra and new administrative challenges have also been large during the current biennium and so special thanks to the Executive Director, Lynn Soby, who has accompanied and taken part in many of our actions and activities, and to the secretariat staff. A special word of thanks to our Treasurer, Colin Humphris, who will leave this position after 6 years in the role, having also been Acting Secretary General just beforehand who, apart from his many scientific contributions, has reminded us of the necessities of the real world when our imagination and idealism start to pull us in a different direction. Finally, I thank you the Council members, the National Adhering Organisations, for your encouragement and involvement in IUPAC.

These are challenging times, but challenges present opportunities, which we must be ready to grasp in innovative ways and with celerity. Thank you all for your confidence in us.

Christopher Brett

IUPAC President

July 2021

# **International Union of Pure and Applied Chemistry**

## **Vice President's Critical Assessment**

**Biennium 2020-2021**

Javier García Martínez

### **Introduction:**

One of the most important tasks of the IUPAC Vice President is to write the Critical Assessment of the Union. This is not an easy job, but it is, undoubtedly, an important activity that allows the future President to build a broad and critical view of the most important aspects of the Union and to share it with our stakeholders. When I was elected in July 2019, I could not have imagined that my first year as an Officer would coincide with a pandemic that has had a profound impact on the lives of millions of people, on the global economy, and, of course, on chemistry education, research, and industry. We had to quickly adapt to travel restrictions. As many organizations, we moved all our activity online in a matter of days. This was not easy, but we benefited from the fact that we were already in the process of implementing remote working. Both our Executive Committee and Bureau meetings are conducted completely online since 2019. However, we had to introduce changes we were not expecting. For example, we had to move our World Chemistry Congress and General Assembly, which were initially planned to be held in Montreal, Canada, to an online format. This change involved a lot of work and significant challenges, especially because during this Council meeting we will deliberate very important issues for the future of IUPAC. Decisions that require in-depth discussions and informal conversations that are difficult to have in front of a screen. I want to thank our Canadian colleagues, our staff, and volunteers who are making every effort to make sure that we have a Congress and General Assembly as interactive, useful, and effective as possible.

During our General Assembly, we will discuss important organizational changes that are a consequence of the recommendations of the Review Group, which was created at the request of the Council held in July 2019 in Paris. Its recommendations, which were endorsed by the Executive Committee and amply debated by the Bureau, include far-reaching changes to the governance of IUPAC and its organizational structure. We had to have a special Council meeting to change our Statutes and Bylaws so that Council meetings can be held without the necessity for in-person meetings and to allow electronic voting in real-time. An important change that was approved unanimously and that will allow us to have a virtual Council Meeting this August.

This Critical Assessment is the result of many conversations with many people inside and outside IUPAC, with representatives of NAOs, with Officers of sister organizations, and with my colleagues on the Executive Committee. This Critical Assessment benefits from the work of analysis and discussion on the state of IUPAC and the surveys conducted by the Evaluation Committee, which I chair, and the Review Group, of which I am a member of. I also benefited from the feedback and suggestions I got after presenting previous versions of my Critical Assessment to both the Executive Committee and the Bureau.

This is a time of change but also of opportunity. If the organizational changes suggested by the Review Group are approved, we will have a more agile decision-

making structure and a clearer scientific direction. Both aspects will help us make better use of our limited resources and better serve our mission and stakeholders.

### **Adapting to the New Normal**

The pandemic has impacted IUPAC as it has done to many other organizations. Thanks to the great job done by our staff and the commitment of our volunteers, we have adapted very quickly to work online. Our video conferencing platform (GoToMeeting) is regularly and effectively used by our members. We have also taken advantage of this situation to increase our online presence. Some of our most successful initiatives (most of them legacies of IYPT and IUPAC100) are online and have reached a very broad audience. Many of our activities (including off-year meetings, meetings of the task force members of the projects, meetings of our governance structure bodies) are now only done completely and exclusively online. This leaves less time for discussion and makes informal conversations more challenging. However, online meetings also offer important advantages. Among them, I would like to mention a more efficient use of our funds, more frequent discussions, and the creation of working groups that can work independently. We have taken advantage of all these opportunities to engage in a very useful and dynamic conversation with our Bureau members since the recommendations of the Review Group were endorsed by the Executive Committee. The possibility of voting electronically also offers some interesting opportunities and simplifies some costly processes.

Reducing to almost zero our travel expenses is having a positive impact on our finances, but this will change when travel restrictions are lifted. Moving forward we must find the right balance between online and in-person meetings. As has been mentioned on several occasions by some of our members, having less personal interaction may pose significant challenges. Online meetings involve inconvenient hours for people living in distant time zones, provide fewer opportunities for quality time discussions, and for informal one-to-one conversations, which are critically important to get to know each other and to solve sensitive issues. Because we are all aware and have suffered from these limitations, we have been doing our best to increase communication and in 2021, we have had frequent online meetings of the EC and Bureau. We also organized several informative sessions with NAOs, which were very well received. Also, different teams have produced various informative documents and reports to tell our stakeholders about the status of the Union and better explain the changes recommended by the Review Group.

A significant part of our budget is used to cover the travel expenses of some of our members and NAOs representatives to our General Assembly. If in the future, at least some of these stakeholders prefer to participate remotely, as electronic voting will be likely to be an option from this year onwards, we will need to reconsider our budget and align national subscriptions with the needs of the Union.

For several years, our financial situation has been a challenge. Traditional sources of income, such as our publications, are now less significant due in part to the changes in the editorial field and to new publishing models. Despite significant efforts, the number of NAOs has not increased significantly. In some parts of the World, our presence is still quite limited, especially in the case of the Arab World, Latin America, and Africa. Some important steps have been taken to increase our sources of income. First of all, I want to mention the Endowment Fund that, if Council approves it and it is properly promoted and managed, could be a great way to secure of finances of the Union. Also, and thanks to a change in our legal status with the US Internal Revenue System (IRS),

now we can receive donations that are tax-deductible. This represents an important and attractive channel to receive funds from individuals and organizations. Another source of income, still limited in volume but that also provides us with great visibility and contributes to our branding, is our Online Shop. I want to use this opportunity to thank our Treasurer Colin Humphris and our Executive Director, Lynn Soby, as they have been instrumental in these actions.

Another important addition to our structure, if Council decides to approve the proposal of the Bureau, is the new Standing Committee on Ethics, Diversity, Equity, and Inclusion (CEDEI). As an international scientific organization, we must maintain the highest levels of ethics, transparency, and intensify our efforts in promoting diversity, equality, and inclusion. This Committee will be instrumental in developing our whistleblower policy and will serve as a confidential and safe point of contact for anyone who may feel harassed or discriminated against or who has witnessed a behaviour inconsistent with the values, mission, and strategic plan of the Union.

### **IUPAC Digital – An accelerated process**

The year 2019 was very important for IUPAC as we celebrated both our 100 years of history and the International Year of the Periodic Table. That same year, we started several online activities that were extremely successful in terms of participation and that have helped us to improve the public image and outreach of the IUPAC. These include:

1. Periodic Table Challenge. An online competition about the periodic table with over 300 questions and multiple answers about the chemical elements. In October 2020, the estimated number of unique players was over 110 000 from 155 countries. The online game is available in English, Arabic, Russian, Spanish, and Chinese.
2. Global Women's Breakfast. Also launched in 2019 coinciding with the IYTP and IUPAC100, this hybrid online and in-person activity aims at assisting women chemists to expand their network of contacts, both locally and internationally. Women at different stages of their individual careers are encouraged to inform each other about their career progress, and together explore opportunities, in professional development and in research or teaching horizons.
3. Top Ten Emerging Technologies in Chemistry. This is an effort to showcase the value of Chemistry and to inform the general public as to how the chemical sciences contribute to the well-being of society and the sustainability of Planet Earth. These ten emerging technologies are selected on the basis of those in-between a new scientific discovery and a fully commercialized technology, and those with the greatest capacity to open new opportunities in chemistry and beyond.
4. This year, ChemVoices was added as one of our online activities. This joint initiative with the International Younger Chemists Network aims at showcasing the talents and impact of early-career scientists worldwide. It is a platform to discuss issues that are relevant and of immediate concern to early-career scientists.

As I have just mentioned, we already had a significant online presence before the pandemic. We used the opportunity given by the 2019 International Year of the Periodic Table and our Centenary, IUPAC100, to boost our online visibility and outreach. But, also internally we did significant efforts to take advantage of the opportunities posed by new technologies and remote working. Also in 2019, both our Bureau and Executive Committee started to have their meetings exclusively online. The last in-person meeting of the Bureau was in Bratislava on April 7-8 2018 and the last in-person meeting of the Executive Committee was in Alcala University, Madrid, Spain, on November 17-18 2018. Obviously, the quality of the discussions, the richness of the debate, and the opportunities for personal interactions are significantly reduced when in-person meetings that last several days are replaced by a few-hour remote meeting. That is why we have moved to much shorter and focused meetings. Instead of having a long list of issues to cover and a lot of reports from our Divisions and our various Committees, we have reduced the agenda of our meetings to just a few items. We have been also using breakout sessions and virtual working groups. We are learning as we go. This has not been an easy job; that is why I want to use this opportunity to thank especially our Secretariat for making every effort to make our online meetings more effective and interactive and to our members, many of whom have been connected at inconvenient hours, to say the least.

But besides how we use new technologies to communicate both internally and externally, there is a clear opportunity for IUPAC to lead in the digital space. In the same way, we did last century with chemical nomenclature and terminology, now IUPAC can help to set the global standards for creating, sharing, managing, chemistry data. Some of our members, especially from CPCDS, are part of an international initiative, called FAIR (Findable, Accessible, Interoperable, Reusable), which aims at creating the right protocols for sharing chemical information. Leading this effort is not just an opportunity for IUPAC, it is our duty as it is at the core of our mission. This will be one of my top priorities during the next biennium.

### **The Project System**

As part of the activities of the Evaluation Committee, we have assessed how our Project System works, the number of proposals we got in this biennium, and the impact that our projects are generating. I want to use this opportunity to thank all the Evaluation Committee members, especially Mary Garson, our Executive Director Lynn Soby, and our Associate Director Fabienne Meyers for analyzing the status of our Project System in great detail.

As of April 2021, 27 new project proposals had been initiated during the biennium, with approximately half of these involving core scientific work of IUPAC. The new project proposal numbers were in contrast to previous years when the numbers of project submissions have generally been higher. Between 2002-2011, an average of 112 projects were submitted each biennium, with a larger fraction of the submissions in the second year of the biennium. The number of projects is quite uneven between different Divisions and Standing Committees. Some, but not all, Divisions have a dedicated Project Coordinator. The list of 1,411 volunteers shows considerable geographic diversity, with significant participation from North American and European countries. A total of 63 countries contribute task group members.

Core scientific projects generally produce technical reports/recommendations published in *Pure Appl. Chem.*, and in certain cases online repositories of data, whereas outreach/networking projects involve meetings/webinars/websites and other

written material of a general nature. Written outputs from 36 projects completed by April 2021 included two books, 24 articles in *Pure Appl. Chem.*, 13 follow-up articles in *Chem. Int.*, and ~20 other journal articles. Meetings included several workshops and a summer school, plus meetings linked to the gender gap project, and the meeting/event activity linked to the world Chemistry Congress/General Assembly in Paris 2019 celebrating IUPAC100. Two projects completed substantial website repositories of data, three projects set up websites, and one project completed a YouTube video. Several project activities were further captured as IUPAC100 Stories on the IUPAC100 website.

The majority of projects involve female participants; however, task group leadership by women currently sits at <20%.

It appears that few projects other than those explicitly involving the IYCN have young chemist members.

Less than ten projects recorded limited or nil activity on their IUPAC project website page, and 12 projects (17% of total completions) were terminated.

The Evaluation Committee made the following recommendations, that I want to include in my Critical Assessment as they provide a great picture of the weaknesses and opportunities of our Project System:

- All Divisions and Standing Committees should appoint a project coordinator
- Task groups should be encouraged to involve Young Chemists among their project team.
- Quality ('high impact') project proposals from interdivisional or joint Divisional-Standing Committee task groups should be encouraged.
- Overall the project system represents an excellent use of IUPAC's limited funds, and Task Group chairs should be congratulated for their work on the many and diverse range of projects that are funded;
- A number of projects progress very slowly or over time the Task Group loses enthusiasm for the project activity. Projects that are identified as insufficiently high impact, or which do not progress in a timely fashion, should be terminated by the responsible Division or Standing Committee on a biennial basis. At present, the responsibility for project termination is often passed to the Secretariat.

### **Serving our Stakeholders**

As part of the work of the Review Group and to better understand how our stakeholders perceive us, we conducted a survey, which was sent to all the Division Presidents and the Chairs of the Standing Committees. These were the questions:

1. Has your division/ committee been in regular contact with other organizations in your field? Is this formalized? If so in which way? What was the context and content of the contact?
2. Has your division/ committee been in incidental contact with other organizations in the past biennium? Was this formalized? If so in which way? What was the context and content of the contact?

3. Has your division/ committee organized outreach activities in the past biennium, or formally participated in such activities? This includes conferences and any other meetings. When was it held? What was the character of the activity? Who participated in the activity?

4. What are the biggest challenges that you face in bringing projects to completion?

5. Have you faced additional challenges in light of recent budget cuts?

6. Have you faced additional challenges due to the ongoing pandemic?

The main conclusions of this survey were that:

- be more responsive, adjusting priorities in response to the rapidly changing scientific environment and culture;
- remain focused in the core activities of IUPAC but include an emphasis on emerging areas in the chemical sciences;
- embrace technology in the day-to-day operation of the Union;
- promote social equity and diversity in the chemistry community;
- increase the visibility of the Union such that we can recruit top chemists to contribute to the activities of the Union;
- be more communicative in all facets of IUPAC's business; increase communication with NAOs, Associated Organizations, and members.

Based on the responses of this survey and after multiple discussions, the Evaluation Committee decided to include a set of recommendations that were included at the end of its biannual report.

### **IUPAC Organizational Structure Review Group**

At the centenary 50<sup>th</sup> General Assembly meeting in Paris in 2019, Council decided to create a Review Group to “undertake a complete review of the organizational structure of IUPAC, concerning its ability to achieve its scientific objectives, reduce costs, and improve efficiency”. Chaired by former IUPAC President, Mark Cesa, this group has done a thorough analysis of the current status, opportunities, and risks and made a series of recommendations to adapt IUPAC to the 21st century, better serve the chemistry community, and align our structure, priorities, and governance to our Strategic Plan and Mission.

As part of the work of the Review Group, a survey was designed, sent to 1,700 stakeholders and close to 450 responses were received and analyzed in a series of meetings.

The Review Group identified some untapped opportunities. I would like to mention the ones that I found more pertinent and timely. For example, some of our online activities have opened us the door in some countries that are not NAOs. We have now champions in those countries who may be willing to work towards applying for NAO status or at least to strengthen their relationship with IUPAC.

Electronic voting may allow some NAOs to participate in our GA without the need to travel internationally or expending any funds. Also, we don't need to reimburse those

delegates who are not travelling, which may open the door for some very low membership fees for low-income countries.

Our projects may now cover other expenses (online tools, websites, virtual issues...) as it is likely that the travel costs will be lower in the foreseeable future.

Our Divisions and Standing Committees may use some of their funds to support their own online activities as they will be expending less on travelling.

I also would like to mention here some aspects related to the recommendations made by the Review Group on how to improve communication. This is a critically important challenge for any organization, but much more for an international intuition with more than a hundred years of history. Improving communication was one of the clearer requests mentioned by those who responded to our survey. Besides improving our website or including in our landing page a welcome video by the President, I want to mention here the creation of two Forums, the NAO Forum and the Presidents' Forum. The former is an online and informal meeting of our NAOs (a catch-up Council), an opportunity to inform our stakeholders on what is going on in the Union and to answer any questions they may have. The latter builds on the opportunity that many presidents or representatives of our sister organizations (chemical societies and federations of chemical societies) attend our General Assemblies. We could invite all of them to join us there in a Forum to discuss topics of mutual interest and decide on joint activities. This initiative will increase our visibility, leadership, and impact worldwide. These are two activities that I will launch during my presidency.

### **Building a more agile and impactful organization**

As mentioned before, the IUPAC Organizational Structure Review Group was established at the request of the Council to undertake a complete review of the organizational structure of IUPAC, concerning its ability to achieve its scientific objectives, reduce costs, and improve efficiency. This group was formed and started working immediately. A report with their conclusions was submitted in December 2020. Among many very useful recommendations made by the Review Group, two were unanimously endorsed by the Executive Committee. These are the creation of an Executive Board and a Science Board. The reason for this major change in our organizational structure is two-fold. On the one hand, having a smaller one-body decision-making committee (the Executive Board). On the other hand, to establish a Science Board that will set the scientific priorities of the Union and will decide on the areas that we should be working on. This recommendation was endorsed by the Executive Committee. During the first quarter of 2021, Bureau – organized in three working groups – has prepared a discussion paper that will be used during the virtual Council meeting in August 2021 to create the basis for the changes in our Bylaws and Statutes. This strategy will allow our stakeholders to have a direct role in deciding on the changes that will be voted on in a future Special Council Meeting.

After many years of experience, first as AM, TM, and VP in Division II, and later as a member of the Bureau and the Executive, I am convinced that we need to move from a hierarchical decision-making process (Officers – Executive Committee – Bureau) to a more agile and simple way to agree and execute on the key aspects of our Union. Similarly, it is urgent that we have a high-level body whose sole task will be to decide on the scientific priorities of the Union. This is a critically important change in our organizational structure as, if properly managed, this group of prominent chemists will help us be more relevant, impactful, and efficient. Now, as Vice-president, I am even

more convinced of the importance and convenience of these timely changes suggested by the Review Group after careful assessment of our structure and scientific impact.

Chemistry is quickly evolving. The impact of artificial intelligence in chemistry research and industry is an excellent example of how rapidly things are changing in our field. I am mentioning AI because its impact on the future of chemistry will be the topic of this year's WCLM. We have to adapt as an international organization of volunteers to better serve the chemistry community. Our best-known activities, like nomenclature, terminology, the update of atomic weights, and the approval and naming of new elements, will continue to be critically important moving forward. We must do our very best to preserve our prestige and reputation, built over decades. As I recently said in my invited column in *Chemistry International*: "beyond organizational changes and the use of new technologies, if IUPAC is to continue to play a leading role in our second century of history, each of us must work to make it happen. Our core activities, such as nomenclature and terminology, the determinations of atomic weights, and the naming of new chemical elements, will continue to be a priority and one of the most important things we do". But now we have to make all that information widely and easily accessible. The digitalization of the Gold Book is a perfect example of what I am saying. I want to use this opportunity to thank all our volunteers and those who are helping in moving to the digital age to make IUPAC more open, transparent, and impactful.

I also want to mention that the organizational changes proposed by the Review Group could also contribute to improving our financial situation and to making a more efficient use of our limited resources. A smaller more agile decision-making body (the Executive Committee) could contribute to reducing our expenses. Some of our members have pointed out that reducing the size of our key committees may reduce representativeness and diversity. That is definitely a possibility and something we should address properly, but a smaller group will be more efficient and could help us cut some costs. Similarly, the Science Board will play a key role in setting our scientific priorities, in deciding on how we should use our funds to increase scientific impact, and in establishing alliances with other organizations. All these actions will eliminate some unnecessary expenses and increase the impact of the science done by our Divisions and Committees.

### **Change is the rule of life. Building the IUPAC of the future.**

When I was elected vice-president in July 2019, in the midst of our 100 years of history celebrations, it was already clear that the Union was ready for (and needed) some changes to better adapt to new ways of working, to be more agile and effective and to better serve our mission. Aware of this reality, Council decided to establish a working group to undertake a complete review of the organizational structure of IUPAC. However, nobody could imagine that our second century of history would begin with a pandemic. We had to quickly adapt to a completely new way of working that has its benefits and also its challenges. As we move forward, we must decide what to keep and what to change. And all of this we have to do in the middle of a difficult financial situation. Of course, the travel restrictions caused by the pandemic reduced our expenses, but this is not sustainable. As with many other organizations, we will find the right balance between in-person and remote work.

I am writing this Critical Assessment as we are discussing the most profound changes in our Union in its more than one hundred years of history. It is my opinion, as well as that of my fellow Officers and Executive Committee members, that we must change our

organizational structure to have a more effective and agile decision-making process and to better set up our scientific priorities and agenda. Beyond how we will be working in the future, online, in-person, or hybrid, we must have the right structure to quickly and meaningfully respond to a rapidly changing reality and, in doing so, better serve the chemistry community.



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

Item Number(s)

9 Report of the Secretary General

Professor Richard Hartshorn

### Secretariat

The IUPAC Secretariat has continued to function well and to support Division and Committee activities throughout what has been a very challenging period. Major initiatives like the Global Women's Breakfast and the Periodic Table Challenge require significant Secretariat support and are a credit to our staff as well as to the volunteers that organised them.

The election process for this biennium is essentially complete, other than those being conducted as part of the Council meeting. A significant amount of staff and volunteer time has been committed to supporting this exercise. Elections and the resulting renewal and invigoration, from bringing in new people and new leaders, are vital to IUPAC; but this has to be balanced against the administrative overhead associated with running them, and the positives that can result from a sense of continuity.

### Conferences

It will be no surprise to you all that the number of IUPAC-endorsed conferences has plummeted. In the year from March 2020, there were over 40 entries on the IUPAC events calendar. 26 of them were either postponed or cancelled, and a significant number (15 or so) were converted to (or were always planned to be) on-line events or webinars. In the next year, we have only 17 entries on our calendar. The damage that this does to our sense of community in science, and to our ability to plan and advance science is simply not quantifiable. Closer to home, without these conferences, we will have serious challenges in filling issues of Pure and Applied Chemistry. IUPAC Committees and Divisions are stepping up to coordinate special issues in their areas, and I thank them for their willingness to do so. I encourage others to take on that challenge as well.

### Projects

Fabienne has provided the following data on IUPAC project submissions:

2020: 23 submissions recorded  
2019: 46 submissions recorded  
2018: 42 submissions recorded  
2017: 41 submissions recorded  
2016: 48 submissions recorded  
2015: 58 submissions recorded  
2014: 43 submissions recorded  
2013: 58 submissions recorded



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

It is quite clear that last year was not a good one from the point of view of project planning and submission. Perhaps that is not a surprise, given the challenges of trying to do creative things via zoom or similar media. So far this year there have been only 16 project submissions, of which 13 have been approved so far, which indicates that these challenges continue.

### The Gold Book

As you know, the Gold Book is one of our most-used resources, and we are undertaking a major (and long overdue) renewal of it. This is a major exercise, which will involve numerous projects right across the organisation. As part of this exercise, and in recognition of some of the challenges involved, we have established an editorial board to manage this process. Some of the projects are already underway, while others are still being scoped and developed. I want to thank all of those involved for their investment of time, both already committed and in future. The effort will be worth it. I particularly want to thank Stuart Chalk for his efforts, and also Leah McEwen and Jürgen Stohner and their teams in CPCDS and ICTNS.

### Policy Development

Recently, we have been going through a process of developing IUPAC policies on Privacy, Conflict of Interest, and Harassment. I thank the elected members of Bureau for their engagement in the groups that I set up for this purpose. The resulting draft policies are attached to this report for consideration and comment by Bureau. These policies will require approval from Council, and we anticipate doing this during the Council meeting in August. An Accounting Document Retention Policy is also being developed, with input from the Auditors, and development of a wider policy on document retention within IUPAC is also under consideration (by the CPCDS Sub-Committee on Records and Archives), and elements of this will be examined in agenda item 10.2.

### Succession Planning

Finally, I note that I have only two-and-a-bit more years as Secretary General. I have little doubt that time will pass very quickly. I invite you all to think of people you know whom you believe would be a good fit as Secretary General. I would be very happy to discuss this further with you or with others who have questions about the role.

[illegible]

[illegible]

## IUPAC Income Statement - 2020 Summary

	December 2019 Actual	December 2020 Actual	2020 Annual Budget	2020 Actual vs Budget Variance
Income				
Program Income	\$ 970,729	\$ 1,088,284	\$ 1,137,691	(49,407)
Direct Public Support	48,019	27,000	36,000	(9,000)
Investments	829,310	723,598	91,000	632,598
Sponsorship Revenue	46,262	(0)	0	(0)
Merchandise Revenue - Pins	249	167	0	167
Total Income	1,894,568	1,839,049	1,264,691	574,358
Gross Profit	\$ 1,894,568	\$ 1,839,049	\$ 1,264,691	574,358
Expense				
Awards, Grants & Contribution	46,566	21,955	0	(21,955)
Fixed Costs - Salaries & Benefits	564,327	567,187	614,965	47,778
Lease, Insurance & Bank Fees	93,004	83,780	92,200	8,420
General & Administrative Expenses	135,313	97,818	83,615	(14,203)
Contracted Services	89,854	126,035	98,950	(27,085)
Depreciation Expense	53,010	53,064	52,120	(944)
Other Expenses	29,501	28,479	29,815	1,336
Travel & Meetings	572,870	7,761	292,029	284,268
Miscellaneous Expense	3	(1,948)	0	1,948
Total Expenses	\$ 1,584,448	\$ 984,132	\$ 1,263,694	279,562
Net Ordinary Income / (Loss)	\$ 310,121	\$ 854,917	\$ 997	853,920
Other Income & Expenses				
Other (Income)	(9,985)	(95,643)	0	95,643

	December 2019 Actual	December 2020 Actual	2020 Annual Budget	2020 Actual vs Budget Variance
Other Expense	<u>15,029</u>	<u>4,166</u>	<u>10,000</u>	<u>5,834</u>
Net Other Income / Expense	\$ <u>5,044</u>	\$ <u>(91,477)</u>	\$ <u>10,000</u>	<u>101,477</u>
Nominal Income / (Loss) for the period	\$ <u><u>305,078</u></u>	\$ <u><u>946,394</u></u>	\$ <u><u>(9,003)</u></u>	<u><u>955,397</u></u>

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## IUPAC Income Statement - 2020 Detail

### Ordinary Income/Expense

#### Income

##### Program Income

National Suscriptions & Service Charges	828,094	839,912	853,291	(13,379)
Associated Organization Membership - ANAO	0	500	900	(400)
Associated Organization Membership - AO	(2,770)	850	3,000	(2,150)

##### Company Associates

CA - NAO	21,000	23,500	20,000	3,500
CA - Rest of World	4,000	8,000	5,000	3,000
Total Company Associates	25,000	31,500	25,000	6,500

##### Affiliate Membership Program

AMP - Chemical Society	8,907	9,840	20,000	(10,160)
AMP - Individual Members	7,600	8,250	5,000	3,250
Total Affiliate Membership Program	16,507	18,090	25,000	(6,910)

##### Publication & Royalty Program

Publication Income	99,017	187,167	210,000	(22,833)
Database Income - De Gruyter	0	0	500	(500)
Database Income - Springer	0	0	10,000	(10,000)

	December 2019 Actual	December 2020 Actual	2020 Annual Budget	2020 Actual vs Budget Variance
Royalty Income	4,881	10,265	10,000	265
Total Publication & Royalty Program	103,897	197,432	230,500	(33,068)
Total Program Income	970,729	1,088,284	1,137,691	(49,407)
Direct Support				
Foundation, Trust, Public & Gov't Grants	48,019	27,000	36,000	(9,000)
Total Direct Public Support	48,019	27,000	36,000	(9,000)
Investment Income				
Dividend & Int Inc - Securities	111,542	90,456	141,000	(50,544)
Realized Gain or (Loss)	43,420	184,833	(50,000)	234,833
Unrealized Gains or (Loss)	674,348	448,309	0	448,309
Total Investments Income	829,310	723,598	91,000	632,598
Online Shop	249	167	0	167
Sponsorship Revenue				
IUPAC 100	12,022	0	0	0
IYPT	0	0	0	0
Other	34,240	(0)	0	(0)
Total Sponsorship Revenue	46,262	(0)	0	(0)
Total Income	1,894,568	1,839,049	1,264,691	574,358
Gross Profit	\$ 1,894,568	\$ 1,839,049	\$ 1,264,691	574,358
Expense				
Awards, Grants & Contributions				
Cash & Non Cash Awards and Grants	46,566	21,955	0	(21,955)
Total Awards, Grants & Contributions	46,566	21,955	0	(21,955)

	December 2019 Actual	December 2020 Actual	2020 Annual Budget	2020 Actual vs Budget Variance
Fixed Costs - Salaries & Benefits				
Staff Salaries	457,448	475,751	469,180	(6,571)
Employee Earned Vacation	6,072	7,135	35,275	28,140
Employee Benefits	100,808	84,301	110,510	26,209
Total Salaries & Benefits	564,327	567,187	614,965	47,778
Insurance, Lease & Bank Fees				
Insurance - Business & Gen Liability	1,512	680	1,300	620
Operating Lease Expense	57,590	58,314	69,363	11,049
Payroll Proc Fees, Bank Fees, Interest & Finance Charges	33,902	24,785	21,537	(3,248)
Total Insurance, Lease & Bank Fees	93,004	83,780	92,200	8,420
General & Administrative Exp				
Office Supplies	4,865	5,150	3,600	(1,550)
IT Support & Maintenance	78,687	48,896	35,180	(13,716)
Communication Expense	5,322	7,825	5,535	(2,290)
Cost of CI Production	13,772	24,013	32,000	7,987
Printing & Postage Expense	32,667	11,935	7,300	(4,635)
Total General & Administrative Exp	135,313	97,818	83,615	(14,203)
Contracted Services				
Auditing Fees	12,795	12,675	18,950	6,275
Legal Fees	6,833	4,812	0	(4,812)
Database Programming Exp	882	719	0	(719)
Human Resources Consulting Exp	0	21	15,000	14,979
Marketing & Design Exp	(2,914)	44,445	20,000	(24,445)
Investment Management Fees	46,048	53,822	40,000	(13,822)
Contract Labor	26,210	9,542	5,000	(4,542)
Total Contracted Services	89,854	126,035	98,950	(27,085)
Depreciation Expense	53,010	53,064	52,120	(944)
Other Expenses				

	December 2019 Actual	December 2020 Actual	2020 Annual Budget	2020 Actual vs Budget Variance
Membership - ICSU	27,599	27,311	28,440	1,129
Membership, License & Dues - Secretariat	275	630	275	(355)
Staff Development & Training	0	71	500	429
Employee Welfare	1,627	468	600	132
Total Other Expenses	29,501	28,479	29,815	1,336
Travel & Meetings				
Conference, Convention & Meetings				
Conference, Conventions & Meetings - Officers	0	0	0	0
Conference, Conventions & Meetings - Staff (Comm)	7,330	0	0	0
Conference, Conventions & Meetings - Staff (Sec)	0	0	0	0
Conference, Conventions & Meetings - Members	20,815	0	5,000	5,000
Total Conference, Convention & Meetings	28,146	0	5,000	5,000
Airfare & Transportation				
Airfare & Trans - Officers	29,984	1,637	12,176	10,539
Airfare & Trans - Staff (Comm)	8,865	0	4,227	4,227
Airfare & Trans - Staff (Sec)	6,043	0	2,818	2,818
Airfare & Trans - Members	260,551	3,181	150,441	147,260
Total Airfare & Transportation	305,443	4,817	169,662	164,845
Hotel & Subsistence				
Hotel & Subsistence - Officers	18,538	262	21,052	20,790
Hotel & Subsistence - Staff (Comm)	1,710	61	2,480	2,419
Hotel & Subsistence - Staff (Secretariat)	9,793	0	1,409	1,409
Hotel & Subsistence - Members	207,200	2,195	87,176	84,981
Total Hotel & Subsistence	237,241	2,517	112,117	109,600
Gen & Admin Expenses				
Gen & Admin Exp - Officers	0	359	500	141
Gen & Admin Exp - Staff (Comm)	288	0	250	250
Gen & Admin Exp - Members	1,751	67	4,500	4,433
Total Gen & Admin Expenses	2,039	426	5,250	4,824

	December 2019 Actual	December 2020 Actual	2020 Annual Budget	2020 Actual vs Budget Variance
Total Travel & Meetings	572,870	7,761	292,029	284,268
Micellaneous Expense	3	(1,948)	0	1,948
Total Expense	1,584,447	984,132	1,263,694	279,562
Gross Operating Profit	\$ 310,122	\$ 854,917	\$ 997	853,920
Other Income/Expense				
Other Income				
Interest Income	194	143	0	143
Refunds & Reimbursements	9,791	0	0	0
Loan Forgiveness	0	95,500	0	95,500
Total Other Income	9,985	95,643	0	95,643
Other Expense				
(Gain) / Loss on Exchange Rates	15,029	4,166	10,000	5,834
(Gain) / Loss on Disposal of Asset	0	0	0	0
Restricted Funds Released	0	0	0	0
Total Other Expense	15,029	4,166	10,000	5,834
Nominal Income / (Loss) for the period	\$ 305,078	\$ 946,394	\$ (9,003)	955,397

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1		IUPAC Balance Sheet																	
2		As of 31 December 2020																	
3																			2019 / 2020
4									Dec-16		Dec-17		Dec-18		Dec-19		Dec-20		Variance
5		ASSETS																	
6				Current Assets															
7				Checking/Savings															
8					Wells Fargo USD - 0155				16,092		79,257		252,705		8,950		252,833		243,883
9					BB&T USD - 6301				651		5,642		0		18,584		38,345		19,761
10					BB&T USD 4989 IUPAC 100				0		0		100		3,128		0		(3,128)
11					BB&T USD 4970 IYPT 2019				0		0		100		2,373		0		(2,373)
12					BB&T USD 6201 IYCN				0		0		0		5,051		2,490		(2,561)
13					BB&T Inv Acct - 2564 8836				49,137		140,984		2,334		89,785		0		(89,785)
14					BB&T Inv Acct - 3805 0889				29,405		62,419		122,062		147,719		0		(147,719)
15					€URO BB&T - 101092				84,440		15,685		2,923		39,322		10,404		(28,917)
16					Raymond James Cash				0		0		0		0		101,600		101,600
17				Total Checking/Savings				179,726		303,987		380,224		314,912		405,672		90,760	
18																			
19				Accounts Receivable															
20					Accounts Receivable - USD				16,106		36,332		41,954		2,375		113,355		110,981
21					Accounts Receivable - EUR				90,585		124,929		133,738		116		0		(116)
22					Accounts Receivable - ARS				0		0		0		0		0		0
23					Accounts Receivable - AUD				0		0		0		0		0		0
24					Accounts Receivable - BGN				0		0		0		0		0		0
25					Accounts Receivable - CZK				0		0		0		0		0		0
26					Accounts Receivable - NOK				0		0		0		0		0		0
27					Accounts Receivable - MYR				10,325		0		0		0		0		0
28					Accounts Receivable - CHF				0		0		0		0		0		0
29					Accounts Receivable - CAD				0		0		0		0		0		0
30					Accounts Receivable - TWD				0		0		0		0		0		0
31					Accounts Receivable - TRY				0		0		0		0		0		0
32					Accounts Receivable - KWD				0		0		0		0		0		0
33					Accounts Receivable - ZAR				0		0		0		0		0		0
34					Accounts Receivable - PLN				0		0		0		0		0		0
35					Accounts Receivable - JPY				0		0		0		0		0		0
36					Accounts Receivable - ILS				0		0		0		0		0		0
37					Accounts Receivable - SEK				0		0		0		0		0		0
38					Accounts Receivable - JOD				1,063		0		0		0		0		0
39					Accounts Receivable - DKK				0		0		0		0		0		0
40					Accounts Receivable - EGP				0		0		0		0		0		0
41					Accounts Receivable - CNY				(746)		144,377		(0)		0		0		0
42					Accounts Receivable - JMD				0		0		0		0		0		0
43					Allowance for Doubtful Acct				(25,349)		0		0		0		0		0
44				Total Accounts Receivable				91,983		305,638		175,693		2,490		113,355		110,865	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	IUPAC Balance Sheet																		
2	As of 31 December 2020																		
3																			2019 / 2020
4									Dec-16		Dec-17		Dec-18		Dec-19		Dec-20		Variance
45																			
46				Other Current Assets															
47					Undeposited Funds				0		0		606		313		0		(313)
48					Sales Tax Receivable				1,336		907		627		2,588		961		(1,627)
49					Other Current Receivables				0		0		0		1		0		(1)
50																			
51																			
52				Prepaid Expenses															
53					Prepaid Insurance				1,680		1,641		1,665		1,612		1,704		91
54					Other Prepaid Expenses				702		3,180		4,095		3,960		9,574		5,614
55					Prepaid General Assembly Exp				0		0		21,371		0		0		0
56																			
57				Total Prepaid Expenses					2,382		4,822		27,132		5,572		11,278		5,706
58																			
59			Total Other Current Assets					3,718		5,729		28,365		8,475		12,240		3,765	
60																			
61			Total Current Assets					275,427		615,353		584,281		325,877		531,267		205,390	
62																			
63			Fixed Assets																
64			Furniture & Fixtures																
65				Furniture & Fixtures				33,291		33,291		33,291		33,291		33,291		0	
66				Accum Depr - F&F				(9,512)		(14,268)		(19,023)		(23,779)		(28,535)		(4,756)	
67			Total Furniture & Fixtures					23,779		19,023		14,267		9,512		4,756		(4,756)	
68																			
69			Computer & Equipment																
70				Computer & Equipment				25,473		25,473		25,473		26,231		37,977		11,746	
71				Accum Depr - Comp & Equip				(10,591)		(15,685)		(20,780)		(24,695)		(27,691)		(2,996)	
72			Total Computer & Equipment					14,882		9,787		4,693		1,536		10,286		8,750	
73																			
74			Website																
75				Website				0		149,716		159,854		159,854		159,854		0	
76				Accum Depr - Website				0		(28,833)		(60,019)		(91,990)		(123,961)		(31,971)	
77				Database				0		0		55,417		61,235		61,235		0	
78				Accum Depr - Database				0		0		(3,601)		(14,875)		(27,122)		(12,247)	
79				CI Digital				0		0		4,235		4,235		4,235		0	
80				Accum Depr - CI Digital				0		0		(423)		(1,270)		(2,117)		(847)	
81				Member Authentication				0		0		1,238		1,238		1,238		0	
82				Accum Depr - Member Authentication				0		0		(124)		(371)		(619)		(247)	
83			Total Website					0		120,883		156,576		118,054		72,742		(45,312)	
84																			

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	
1		IUPAC Balance Sheet																		
2		As of 31 December 2020																		
3																			2019 / 2020	
4									Dec-16		Dec-17		Dec-18		Dec-19		Dec-20		Variance	
85																				
86				Website - WIP					136,821		0		0		0		0		0	
87				Database Dev Proj - WIP					12,510		38,975		0		0		0		0	
88				CI Digital - WIP					0		2,310		0		0		0		0	
89				Member Authentication - WIP					0		1,100		0		0		0		0	
90																				
91			Total Fixed Assets						187,992		192,078		175,536		129,102		87,784		(41,318)	
92																				
93			Other Assets																	
94			Security Deposits						3,565		3,565		3,565		3,565		3,565		0	
95																				
96			Marketable Securities																	
97				Investment - BB&T 2564 8836					1,129,798		1,036,712		1,235,385		1,115,512		0		(1,115,512)	
98				Investment - BB&T 3805 0889					2,759,284		3,060,814		2,494,441		3,123,250		0		(3,123,250)	
99				Raymond James Investments					0		0		0		0		4,991,959		4,991,959	
100			Total Marketable Securities						3,889,081		4,097,527		3,729,826		4,238,761		4,991,959		753,198	
101																				
102																				
103			Total Other Assets						3,892,646		4,101,092		3,733,391		4,242,327		4,995,524		753,198	
104																				
105		TOTAL ASSETS							\$	4,356,067	\$	4,908,523	\$	4,493,208	\$	4,697,305	\$	5,614,575	\$	917,269
106																				
107																				
108		LIABILITIES & EQUITY																		
109		Liabilities																		
110		Current Liabilities																		
111				Accounts Payable																
112					Accounts Payable - USD					39,371		112,860		51,853		20,464		44,539		24,075
113					Accounts Payable - EUR					41,754		67,636		33,419		12,821		33		(12,789)
114					Accounts Payable - MYR					0		0		598		0		0		0
115					Accounts Payable - GBP					(0)		8,254		2,351		2,191		67		(2,124)
116					Accounts Payable - HUF					0		0		0		2,011		(0)		(2,011)
117					Accounts Payable - CHF					(0)		251		0		0		0		0
118					Accounts Payable - JPY					0		0		0		0		0		0
119					Accounts Payable - AUD					0		236		936		0		0		0
120					Accounts Payable - SEK					0		577		204		0		0		0
121					Accounts Payable - RUB					0		0		0		0		0		0
122					Accounts Payable - ZAR					0		1,979		0		0		0		0
123					Accounts Payable - PLN					0		0		0		0		0		0
124					Accounts Payable - NOK					0		0		0		0		0		0

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S					
1									IUPAC Balance Sheet															
2									As of 31 December 2020															
3																			2019 / 2020					
4									Dec-16		Dec-17		Dec-18		Dec-19		Dec-20		Variance					
125							Accounts Payable - KRW		0		0		874		0		0		0					
126							Accounts Payable - NPR		0		0		0		0		0		0					
127							Accounts Payable - DKK		0		709		401		999		0		(999)					
128							Accounts Payable - CAD		0		0		0		0		0		0					
129							Accounts Payable - NZD		0		1,870		0		3,222		0		(3,222)					
130							Accounts Payable - INR		0		0		(405)		583		349		(234)					
131							Accounts Payable - THB		0		0		0		0		0		0					
132							Accounts Payable - CZK		0		1,387		819		0		0		0					
133							Accounts Payable - PKR		0		0		0		0		0		0					
134							Accounts Payable - MAD		0		1,704		0		0		0		0					
135							Accounts Payable - TRY		0		0		0		0		0		0					
136							Accounts Payable - ILS		0		0		0		782		0		(782)					
137							Accounts Payable - BRL		0		0		0		0		0		0					
138							Accounts Payable - COP		0		0		0		0		0		0					
139							Accounts Payable - RSD		0		0		0		0		0		0					
140							Accounts Payable - HRK		0		0		0		0		0		0					
141							Accounts Payable - CNY		0		0		0		3,791		3,791		0					
142							Accounts Payable - XAF		0		0		0		0		0		0					
143							Accounts Payable - NGN		0		0		0		0		0		0					
144							Accounts Payable - BDT		0		1,328		0		0		0		0					
145							Accounts Payable - HKD		0		0		0		0		0		0					
146							Accounts Payable - TWD		0		0		0		0		0		0					
147							Accounts Payable - MXN		0		0		0		0		0		0					
148							Accounts Payable - DZD		0		0		0		0		0		0					
149							Accounts Payable - VND		0		0		0		0		0		0					
150							Total Accounts Payable		81,125		198,792		91,050		46,863		48,778		1,915					
151																								
152							Credit Cards																	
153							BB&T VISA Credit Card - 3774		172		1,053		4,798		6,906		13,015		6,109					
154							Total Credit Cards		172		1,053		4,798		6,906		13,015		6,109					
155																								
156							Other Current Liabilities																	
157							Payroll Liabilities																	
158							Accrued Vacation		44,701		50,635		41,746		47,818		54,953		7,135					
159							403B Employee Retirement Payable		0		(1,600)		0		0		0		0					
160							Total Payroll Liabilities		44,701		49,035		41,746		47,818		54,953		7,135					
161																								
162							Unearned Membership Income																	
163							Unearned Membership - NAO		18,668		48,962		158,828		59,051		70,176		11,125					
164							Unearned Membership - ANAO		0		250		0		0		250		250					

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1		IUPAC Balance Sheet																	
2		As of 31 December 2020																	
3																			2019 / 2020
4									Dec-16		Dec-17		Dec-18		Dec-19		Dec-20		Variance
165							Unearned Membership - AO		600		750		150		550		350		(200)
166							Unearned Membership - AMP CS		220		0		0		120		330		210
167							Unearned Membership - AMP Indiv		985		740		0		4,150		1,800		(2,350)
168							Unearned Membership - CA NAO		0		0		0		1,500		4,000		2,500
169							Unearned Membership - CA ROW		1,350		0		0		0		2,500		2,500
170							Total Unearned Membership Income		21,823		50,702		158,978		65,371		79,406		14,035
171																			
172							Unearned Publication Inc		0		125		0		525		174		(351)
173																			
174							Deferred Rent		21,506		19,351		15,640		11,667		4,702		(6,965)
175																			
176							Short-term Notes Payable												
177							BB&T - Line of Credit		100,000		350,000		311,094		336,784		0		(336,784)
178							Total Short-term Notes Payable		100,000		350,000		311,094		336,784		0		(336,784)
179																			
180							Raymond James Margin Account Loan		0		0		0		0		240,762		240,762
181							Due to IYCN		0		0		0		5,051		2,490		(2,561)
182							Other Current Liabilities		0		0		(1,318)		22		30		8
183																			
184							Total Other Current Liabilities		188,030		469,213		526,139		467,238		382,517		(84,721)
185							Total Current Liabilities		269,328		669,058		621,988		521,006		444,310		(76,697)
186																			
187							Total Liabilities		269,328		669,058		621,988		521,006		444,310		(76,697)
188																			
189																			
190							Equity												
191							Net Asset w/ Donor Restriction		204,357		204,357		204,357		204,357		204,357		0
192							Net Asset w/o Donor Restriction		100,110		111,809		108,761		108,761		120,761		12,000
193							Unrestricted Net Assets		3,749,795		3,770,606		3,926,347		3,558,103		3,898,753		340,650
194							Nominal income / (loss) for the period		32,477		152,693		(368,245)		305,078		946,394		641,316
195																			
196							Total Equity		4,086,739		4,239,465		3,871,221		4,176,299		5,170,265		993,966
197																			
198							TOTAL LIABILITIES & EQUITY	\$	4,356,067	\$	4,908,523	\$	4,493,208	\$	4,697,305	\$	5,614,575	\$	917,269
199																			
200																			
201																			
202																			
203																			

[illegible]

# IUPAC Income Statement - Summary

	December 2019 Actual	2019 Annual Budget	2019 % of Annual Budget	2019 Actual vs Budget Variance	December 2020 Actual	2020 Annual Budget	2020 % of Annual Budget	2020 Actual vs Budget Variance	Actual 2019 vs 2020 Variance
Income									
Program Income	\$ 970,729	\$ 1,298,769	\$ 74.74%	(328,040)	\$ 1,088,284	\$ 1,137,691	95.66%	(49,407)	117,555
Direct Public Support	48,019	41,000	117.12%	7,019	27,000	36,000	75.00%	(9,000)	(21,019)
Investments	829,310	142,000	584.02%	687,310	723,598	91,000	795.16%	632,598	(105,712)
Sponsorship Revenue	46,262	0	0.00%	46,262	(0)	0	0.00%	(0)	(46,262)
Merchandise Revenue - Pins	249	0	0.00%	249	167	0	0.00%	167	(81)
Total Income	1,894,568	1,481,769	127.86%	412,799	1,839,049	1,264,691	145.41%	574,358	(55,519)
Gross Profit	\$ 1,894,568	\$ 1,481,769	\$ 127.86%	412,799	\$ 1,839,049	\$ 1,264,691	145.41%	574,358	(55,519)
Expense									
Awards, Grants & Contribution	46,566	10,000	465.66%	(36,566)	21,955	0	0.00%	(21,955)	24,611
Fixed Costs - Salaries & Benefits	564,327	641,075	88.03%	76,748	567,187	614,965	92.23%	47,778	(2,860)
Lease, Insurance & Bank Fees	93,004	87,454	106.35%	(5,549)	83,780	92,200	90.87%	8,420	9,224
General & Administrative Expenses	135,313	69,125	195.75%	(66,188)	97,818	83,615	116.99%	(14,203)	37,495
Contracted Services	89,854	63,750	140.95%	(26,104)	126,035	98,950	127.37%	(27,085)	(36,181)
Depreciation Expense	53,010	46,104	114.98%	(6,906)	53,064	52,120	101.81%	(944)	(54)
Other Expenses	29,501	28,100	104.99%	(1,401)	28,479	29,815	95.52%	1,336	1,022
Travel & Meetings	572,870	872,340	65.67%	299,470	7,761	292,029	2.66%	284,268	565,109
Miscellaneous Expense	3	0	0.00%	(3)	(1,948)	0	0.00%	1,948	1,951
Total Expenses	\$ 1,584,448	\$ 1,817,948	\$ 87.16%	233,500	\$ 984,132	\$ 1,263,694	77.88%	279,562	600,315
Net Ordinary Income / (Loss)	\$ 310,121	\$ (336,179)	\$ -92.25%	646,300	\$ 854,917	\$ 997	85748.93%	853,920	544,796
Other Income & Expenses									
Other (Income)	(9,985)	0	0.00%	9,985	(95,643)	0	0.00%	95,643	85,658
Other Expense	15,029	10,000	150.29%	(5,029)	4,166	10,000	41.66%	5,834	10,864
Net Other Income / Expense	\$ 5,044	\$ 10,000	\$ 50.44%	4,956	\$ (91,477)	\$ 10,000	-914.77%	101,477	96,522
Nominal Income / (Loss) for the period	\$ 305,078	\$ (346,179)	\$ -88.13%	651,257	\$ 946,394	\$ (9,003)	-10511.99%	955,397	641,317

December 2019 Actual	2019 Annual Budget	2019 % of Annual Budget	2019 Actual vs Budget Variance	December 2020 Actual	2020 Annual Budget	2020 % of Annual Budget	2020 Actual vs Budget Variance	Actual 2019 vs 2020 Variance
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## IUPAC Income Statement - Detail

### Ordinary Income/Expense

#### Income

#### Program Income

National Suscriptions & Service Charges	828,094	876,375	94.49%	(48,281)	839,912	853,291	98.43%	(13,379)	11,818
Associated Organization Membership - ANAO	0	750	0.0%	(750)	500	900	55.56%	(400)	500
Associated Organization Membership - AO	(2,770)	2,000	(138.49%)	(4,770)	850	3,000	28.33%	(2,150)	3,620

#### Company Associates

CA - NAO	21,000	50,000	42.0%	(29,000)	23,500	20,000	117.5%	3,500	2,500
CA - Rest of World	4,000	5,000	80.0%	(1,000)	8,000	5,000	160.0%	3,000	4,000
Total Company Associates	25,000	55,000	45.45%	(30,000)	31,500	25,000	126.0%	6,500	6,500

#### Affiliate Membership Program

AMP - Chemical Society	8,907	37,375	23.83%	(28,468)	9,840	20,000	49.2%	(10,160)	933
AMP - Individual Members	7,600	20,125	37.76%	(12,525)	8,250	5,000	165.0%	3,250	650
Total Affiliate Membership Program	16,507	57,500	28.71%	(40,993)	18,090	25,000	72.36%	(6,910)	1,583

#### Publication & Royalty Program

Publication Income	99,017	250,000	39.61%	(150,983)	187,167	210,000	89.13%	(22,833)	88,150
Database Income - De Gruyter	0	20,144	0.0%	(20,144)	0	500	0.0%	(500)	0
Database Income - Springer	0	22,000	0.0%	(22,000)	0	10,000	0.0%	(10,000)	0
Royalty Income	4,881	15,000	32.54%	(10,119)	10,265	10,000	102.65%	265	5,384
Total Publication & Royalty Program	103,897	307,144	33.83%	(203,247)	197,432	230,500	85.65%	(33,068)	93,534

#### Total Program Income

970,729	1,298,769	74.74%	(328,040)	1,088,284	1,137,691	95.66%	(49,407)	117,555
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#### Direct Support

Foundation, Trust, Public & Gov't Grants	48,019	41,000	117.12%	7,019	27,000	36,000	75.0%	(9,000)	(21,019)
Total Direct Public Support	48,019	41,000	117.12%	7,019	27,000	36,000	75.0%	(9,000)	(21,019)

#### Investment Income

Dividend & Int Inc - Securities	111,542	142,000	78.55%	(30,458)	90,456	141,000	64.15%	(50,544)	(21,086)
Realized Gain or (Loss)	43,420	0	0.0%	43,420	184,833	(50,000)	(369.67%)	234,833	141,413
Unrealized Gains or (Loss)	674,348	0	0.0%	674,348	448,309	0	0.0%	448,309	(226,039)
Total Investments Income	829,310	142,000	584.02%	687,310	723,598	91,000	795.16%	632,598	(105,712)

#### Online Shop

249	0	0.0%	249	167	0	0.0%	167	(81)
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#### Sponsorship Revenue

IUPAC 100	12,022	0	0.0%	12,022	0	0	0.0%	0	(12,022)
IYPT	0	0	0.0%	0	0	0	0.0%	0	0

	December 2019 Actual	2019 Annual Budget	2019 % of Annual Budget	2019 Actual vs Budget Variance	December 2020 Actual	2020 Annual Budget	2020 % of Annual Budget	2020 Actual vs Budget Variance	Actual 2019 vs 2020 Variance
Other	34,240	0	0.0%	34,240	(0)	0	0.0%	(0)	(34,240)
Total Sponsorship Revenue	46,262	0	0.0%	46,262	(0)	0	0.0%	(0)	(46,262)
Total Income	1,894,568	1,481,769	127.86%	412,799	1,839,049	1,264,691	145.41%	574,358	(55,519)
Gross Profit	\$ 1,894,568	\$ 1,481,769	\$ 127.86%	412,799	\$ 1,839,049	\$ 1,264,691	145.41%	574,358	(55,519)
Expense									
Awards, Grants & Contributions									
Cash & Non Cash Awards and Grants	46,566	10,000	465.66%	(36,566)	21,955	0	0.0%	(21,955)	24,611
Total Awards, Grants & Contributions	46,566	10,000	465.66%	(36,566)	21,955	0	0.0%	(21,955)	24,611
Fixed Costs - Salaries & Benefits									
Staff Salaries	457,448	455,514	100.42%	(1,934)	475,751	469,180	101.4%	(6,571)	(18,304)
Employee Earned Vacation	6,072	34,251	17.73%	28,179	7,135	35,275	20.23%	28,140	(1,063)
Employee Benefits	100,808	151,310	66.62%	50,502	84,301	110,510	76.28%	26,209	16,507
Total Salaries & Benefits	564,327	641,075	88.03%	76,748	567,187	614,965	92.23%	47,778	(2,860)
Insurance, Lease & Bank Fees									
Insurance - Business & Gen Liability	1,512	1,250	120.96%	(262)	680	1,300	52.34%	620	832
Operating Lease Expense	57,590	65,404	88.05%	7,815	58,314	69,363	84.07%	11,049	(725)
Payroll Proc Fees, Bank Fees, Interest & Finance Charges	33,902	20,800	162.99%	(13,102)	24,785	21,537	115.08%	(3,248)	9,117
Total Insurance, Lease & Bank Fees	93,004	87,454	106.35%	(5,549)	83,780	92,200	90.87%	8,420	9,224
General & Administrative Exp									
Office Supplies	4,865	3,400	143.09%	(1,465)	5,150	3,600	143.06%	(1,550)	(285)
IT Support & Maintenance	78,687	25,600	307.37%	(53,087)	48,896	35,180	138.99%	(13,716)	29,791
Communication Expense	5,322	5,567	95.6%	245	7,825	5,535	141.38%	(2,290)	(2,503)
Cost of CI Production	13,772	25,858	53.26%	12,086	24,013	32,000	75.04%	7,987	(10,241)
Printing & Postage Expense	32,667	8,700	375.49%	(23,967)	11,935	7,300	163.49%	(4,635)	20,733
Total General & Administrative Exp	135,313	69,125	195.75%	(66,188)	97,818	83,615	116.99%	(14,203)	37,495
Contracted Services									
Auditing Fees	12,795	18,750	68.24%	5,955	12,675	18,950	66.89%	6,275	120
Legal Fees	6,833	0	0.0%	(6,833)	4,812	0	0.0%	(4,812)	2,021
Database Programming Exp	882	0	0.0%	(882)	719	0	0.0%	(719)	163
Human Resources Consulting Exp	0	0	0.0%	0	21	15,000	0.14%	14,979	(21)
Marketing & Design Exp	(2,914)	5,000	(58.27%)	7,914	44,445	20,000	222.22%	(24,445)	(47,358)
Investment Management Fees	46,048	40,000	115.12%	(6,048)	53,822	40,000	134.56%	(13,822)	(7,774)
Contract Labor	26,210	0	0.0%	(26,210)	9,542	5,000	190.84%	(4,542)	16,668
Total Contracted Services	89,854	63,750	140.95%	(26,104)	126,035	98,950	127.37%	(27,085)	(36,181)
Depreciation Expense	53,010	46,104	114.98%	(6,906)	53,064	52,120	101.81%	(944)	(54)

	December 2019 Actual	2019 Annual Budget	2019 % of Annual Budget	2019 Actual vs Budget Variance	December 2020 Actual	2020 Annual Budget	2020 % of Annual Budget	2020 Actual vs Budget Variance	Actual 2019 vs 2020 Variance
Other Expenses									
Membership - ICSU	27,599	27,000	102.22%	(599)	27,311	28,440	96.03%	1,129	288
Membership, License & Dues - Secretariat	275	0	0.0%	(275)	630	275	229.01%	(355)	(355)
Staff Development & Training	0	500	0.0%	500	71	500	14.11%	429	(71)
Employee Welfare	1,627	600	271.23%	(1,027)	468	600	78.03%	132	1,159
Total Other Expenses	29,501	28,100	104.99%	(1,401)	28,479	29,815	95.52%	1,336	1,022
Travel & Meetings									
Conference, Convention & Meetings									
Conference, Conventions & Meetings - Officers	0	0	0.0%	0	0	0	0.0%	0	0
Conference, Conventions & Meetings - Staff (Comm)	7,330	0	0.0%	(7,330)	0	0	0.0%	0	
Conference, Conventions & Meetings - Staff (Sec)	0	0	0.0%	0	0	0	0.0%	0	0
Conference, Conventions & Meetings - Members	20,815	5,000	416.3%	(15,815)	0	5,000	0.0%	5,000	20,815
Total Conference, Convention & Meetings	28,146	5,000	562.91%	(23,146)	0	5,000	0.0%	5,000	28,146
Airfare & Transportation									
Airfare & Trans - Officers	29,984	37,229	80.54%	7,245	1,637	12,176	13.44%	10,539	28,348
Airfare & Trans - Staff (Comm)	8,865	12,924	68.59%	4,059	0	4,227	0.0%	4,227	8,865
Airfare & Trans - Staff (Sec)	6,043	8,616	70.14%	2,573	0	2,818	0.0%	2,818	6,043
Airfare & Trans - Members	260,551	460,003	56.64%	199,452	3,181	150,441	2.11%	147,260	257,370
Total Airfare & Transportation	305,443	518,772	58.88%	213,329	4,817	169,662	2.84%	164,845	300,626
Hotel & Subsistence									
Hotel & Subsistence - Officers	18,538	64,369	28.8%	45,831	262	21,052	1.24%	20,790	18,276
Hotel & Subsistence - Staff (Comm)	1,710	7,582	22.56%	5,872	61	2,480	2.46%	2,419	1,650
Hotel & Subsistence - Staff (Secretariat)	9,793	4,308	227.31%	(5,485)	0	1,409	0.0%	1,409	9,793
Hotel & Subsistence - Members	207,200	266,559	77.73%	59,359	2,195	87,176	2.52%	84,981	205,005
Total Hotel & Subsistence	237,241	342,818	69.2%	105,577	2,517	112,117	2.25%	109,600	234,724
Gen & Admin Expenses									
Gen & Admin Exp - Officers	0	500	0.0%	500	359	500	71.9%	141	(359)
Gen & Admin Exp - Staff (Comm)	288	250	115.24%	(38)	0	250	0.0%	250	288
Gen & Admin Exp - Members	1,751	5,000	35.02%	3,249	67	4,500	1.49%	4,433	1,684
Total Gen & Admin Expenses	2,039	5,750	35.47%	3,711	426	5,250	8.12%	4,824	1,613
Total Travel & Meetings	572,870	872,340	65.67%	299,470	7,761	292,029	2.66%	284,268	565,109
Micellaneous Expense	3	0	0.0%	(3)	(1,948)	0	0.0%	1,948	1,951
Total Expense	1,584,447	1,817,948	87.16%	233,501	984,132	1,263,694	77.88%	279,562	600,314
Gross Operating Profit	\$ 310,122	\$ (336,179)	\$ (92.25%)	646,301	\$ 854,917	\$ 997	85,748.93%	853,920	544,795

	December 2019 Actual	2019 Annual Budget	2019 % of Annual Budget	2019 Actual vs Budget Variance	December 2020 Actual	2020 Annual Budget	2020 % of Annual Budget	2020 Actual vs Budget Variance	Actual 2019 vs 2020 Variance
Other Income/Expense									
Other Income									
Interest Income	194	0	0.0%	194	143	0	0.0%	143	(51)
Refunds & Reimbursements	9,791	0	0.0%	9,791	0	0	0.0%	0	(9,791)
Loan Forgiveness	0	0	0.0%	0	95,500	0	0.0%	95,500	95,500
Total Other Income	9,985	0	0.0%	9,985	95,643	0	0.0%	95,643	85,658
Other Expense									
(Gain) / Loss on Exchange Rates	15,029	10,000	150.29%	(5,029)	4,166	10,000	41.66%	5,834	10,864
(Gain) / Loss on Disposal of Asset	0	0		0	0	0	0.0%	0	0
Restricted Funds Released	0	0	0.0%	0	0	0	0.0%	0	0
Total Other Expense	15,029	10,000	150.29%	(5,029)	4,166	10,000	41.66%	5,834	10,864
Nominal Income / (Loss) for the period	\$ 305,078	\$ (346,179)	\$ (88.13%)	651,257	\$ 946,394	\$ (9,003)	(10,511.99%)	955,397	641,317

2022-2023 Proposed Budget for Council		2022 Budget	2023 Budget	Commentary
<b>Ordinary Income/Expense</b>				
<b>Income</b>				
Program Income				
Membership Dues – NAO		846,110	848,537	
Membership Dues – ANAO		–	–	
Membership Dues – AO		1,500	1,500	
Company Associates				
CA – NAO		25,000	25,000	
CA – Rest of World (Direct through IUPAC)		10,000	10,000	
Total Company Associates		35,000	35,000	
Affiliate Membership Program				
AMP – Chemical Society		10,000	10,000	
AMP – Individual Members		10,000	10,000	
Total Affiliate Membership Program		20,000	20,000	
Publication Income		190,000	190,000	
Database Income – DeGruyter		500	500	
Database Income – AIP		–	–	
Royalty Income		15,000	10,000	
Total Publication Income		205,500	200,500	
<b>Total Program Income</b>		<b>1,108,110</b>	<b>1,105,537</b>	
Direct Public Grants				
Foundation & Trust Grants		10,000	10,000	<a href="#">Linked to Support tab</a>
Total Direct Public Grants		10,000	10,000	
Direct Public Support				
Corporate Contributions		10,000	32,500	<a href="#">Linked to Support tab</a>
Total Direct Public Support		10,000	32,500	
Government Grants				
Government Agency Grants		–	–	<a href="#">Linked to Support tab</a>
Total Government Grants		–	–	
Investments				
Dividend & Int Inc – Securities		140,000	140,000	
Realized Gain or (Loss)		(50,000)	50,000	
Unrealized Gains or (Loss)		–	–	
Total Investments		90,000	190,000	
Sponsorship				
Sponsorship – IUPAC 100		–	–	<a href="#">Linked to Support tab</a>
Sponsorship – IYPT 2019		–	–	<a href="#">Linked to Support tab</a>
Sponsorship – IUPAC Direct Activity		–	–	<a href="#">Linked to Support tab</a>
Sponsorship – IUPAC Projects		–	–	<a href="#">Linked to Support tab</a>
Sponsorship – GW8		5,000	5,000	<a href="#">Linked to Support tab</a>
Total Sponsorship		5,000	5,000	
Merchandise				
Merchandise – Pins		–	–	
Total Merchandise		–	–	
Online Shop/Merchandise		5,000	7,500	Sales
Miscellaneous Income		–	–	
<b>Total Income</b>		<b>1,228,110</b>	<b>1,350,537</b>	
Cost of Goods Sold				
Online Shop		3,000	3,000	
Total Cost of Goods Sold		3,000	3,000	
<b>Gross Profit</b>		<b>1,225,110</b>	<b>1,347,537</b>	
<b>Expense</b>				
Awards, Grants & Contributions				
Cash Awards and Grants		10,000	20,000	
Noncash Awards and Grants		–	–	
Total Awards, Grants & Contributions		10,000	20,000	
Business Expenses				
Bad Debts Expense		–	–	
Total Business Expenses		–	–	
Salaries & Earned Vacation				
Staff Salaries		598,152	529,847	
Earned Vacation Exp		24,961	29,671	
Total Salaries & Earned Vacation		623,113	559,518	
Employee Benefits				
FICA Empr Expense		37,234	29,372	
Medicare Empr Expense		8,673	7,683	
NC SUTA Expense		78	78	
MA SUTA Expense		175	175	
Health Insurance		40,849	45,342	
Dental Insurance		3,257	3,420	
LTD / STD / AD&D (Principal)		5,184	6,221	
Total Employee Benefits		95,450	92,292	
<b>Total - Salaries &amp; Benefits</b>		<b>718,563</b>	<b>651,809</b>	*Recruitment and Handover of Executive Director
Insurance & Workers Comp				
Workers' Compensation		1,200	1,250	
Insurance – Gen Liab & BOP		1,800	1,850	
Total Insurance & Workers Comp		3,000	3,100	
Lease & Rent Expense				
Office Lease – 79 TW Alexander		48,100	49,543	
Office Lease – Operating Exp		3,700	3,900	
Warehouse Lease		–	–	
Xerox Copier Lease		4,700	4,700	
Pitney Bowes – Lease		–	–	
Total Lease & Rent Expense		56,500	58,143	
Interest, Payroll & Bank Fees				
ADP Management Fee		2,800	2,800	
WireTransfer Fees		9,500	9,500	
Bank Analysis Fees		8,232	8,232	
Credit Card Fees		750	750	
Interest Expense		6,000	6,000	
<b>Total Interest, Payroll &amp; Bank Fees</b>		<b>27,282</b>	<b>27,282</b>	

2022-2023 Proposed Budget for Council		2022 Budget	2023 Budget	Commentary
General & Administrative Exp				
Office Supplies		3,600	4,000	
IT Support & Maintenance				
IT Outsourced Partners		7,000	7,000	
IT Outsourced Partners-Program/Project Related		7,000	7,000	
Total IT Support & Maintenance		14,000	14,000	
IT Support - Software		120	120	
Website Hosting/Support				
IUPAC Secretariat and Legacy sites		3,500	3,500	
Program-Specific Hosting		3,000	3,000	
Archives Website Hosting		3,000	3,000	
Gold Book Web Hosting - NF		300	300	
CIAAW.org Web Hosting - NF		300	300	
Domain Reg Expense		200	200	
Total Website Hosting/Support		10,300	10,300	
Software - Program & License		5,500	5,500	
IT Equipment (under \$500)		750	750	
Website - Zoho		800	800	
Database Hosting-ZoHo		3,000	3,000	
Cloud Server File Sharing		6,000	6,000	
Total Cloud Hosting Website/Support		16,050	16,050	
Total IT Support & Maintenance		40,350	40,350	
Communication Expense				
Internet		2,820	2,820	
Phone - Secretariat VoIP		2,500	2,750	
Phone - Boston University		215	215	
Total Communication Expense		5,535	5,785	
Cost of CI Production (DG)				
Distribution Costs - CI Rev Share		14,316	14,316	
Distribution Costs - CI Dist		4,176	4,176	
Distribution Costs - CI Loss		2,983	2,983	
Total Cost of CI Production (DG)		21,474	21,474	
Postage, Prntg & Ref Materials				
Books, Reference & Periodicals		100	100	
Postage & Mailing Expense		4,000	5,700	
Printing & Copying Expense		2,500	3,000	
Total Postage, Prntg & Ref Materials		6,600	8,800	
<b>Total General &amp; Administrative Exp</b>		<b>87,859</b>	<b>90,709</b>	
<b>Contracted Services</b>				
Audit & Tax Fees		16,524	16,854	
Legal Fees		1,500	1,500	
Database Programming Exp		-	-	
Marketing & Design Exp		20,000	20,000	
Human Resources Consulting Exp		7,500	7,500	*Fundraising Outsource Partner
Investment Management Fees		48,000	48,000	
Contract Labor & Interns		5,000	5,000	
Management Consulting		1,000	1,000	
Total Contracted Services		99,524	99,854	
Facilities and Equipment				
Depreciation Expense		52,420	18,830	
Total Facilities and Equipment		52,420	18,830	
Other Expenses				
Membership - ICSU		28,440	29,007	
Membership, License & Dues - Sec		275	275	
Staff Development & Training		500	500	
Employee Welfare		600	600	
Total Other Expenses		29,815	30,382	
<b>Travel &amp; Meetings</b>				
Conference, Convention & Mtngs				
Conf. Conv & Mtngs - Officers		-	-	
Conf. Conv & Mtngs - Staff (Comm)		-	-	
Conf. Conv & Mtngs - Members		5,000	5,000	
Total Conference, Convention & Mtngs		5,000	5,000	
Airfare & Transportation				
Airfare & Trans - Officers		7,740	44,061	<a href="#">Linked to Travel Alloc calc tab</a>
Airfare & Trans - Staff (Comm)		1,536	8,747	<a href="#">Linked to Travel Alloc calc tab</a>
Airfare & Trans - Staff (Sec)		1,055	6,006	<a href="#">Linked to Travel Alloc calc tab</a>
Airfare & Trans - Members		54,711	311,469	<a href="#">Linked to Travel Alloc calc tab</a>
Total Airfare & Transportation		65,042	370,283	
Hotel & Subsistence				
Hotel & Subsistence - Officers		4,232	24,095	<a href="#">Linked to Travel Alloc calc tab</a>
Hotel & Subs - Staff (Comm)		1,698	9,667	<a href="#">Linked to Travel Alloc calc tab</a>
Hotel & Subs - Staff (Sec)		338	1,926	<a href="#">Linked to Travel Alloc calc tab</a>
Hotel & Subsistence - Members		34,689	197,480	<a href="#">Linked to Travel Alloc calc tab</a>
Total Hotel & Subsistence		40,958	233,169	
Travel & Meetings - G & A Exp				
Gen & Admin Exp - Officers		500	500	
Gen & Admin Exp - Staff (Comm)		250	250	
Gen & Admin Exp - Members		2,000	5,000	
Total Travel & Meetings - G & A Exp		2,750	5,750	
<b>Total Travel &amp; Meetings</b>		<b>113,750</b>	<b>614,202</b>	
Miscellaneous Expenses		-	-	
<b>Total Expense</b>		<b>1,198,713</b>	<b>1,614,312</b>	
Net Ordinary Income		26,397	(266,775)	
Other Income/Expense				
Other Income				
Interest Income		-	-	
Refunds & Reimbursements		-	-	
Total Other Income		-	-	
Total Other Income		-	-	
Other Expense				
(Gain) / Loss on Exchange Rates		10,000	15,000	

2022-2023 Proposed Budget for Council		2022 Budget	2023 Budget	Commentary		
(Gain) / Loss Disposal – Asset		–	–			
Temporarily Restricted Activity						
Restricted Funds Released		–	–			
Total Temporarily Restricted Activity		–	–			
Total Other Expense		10,000	15,000			
Net Other Income (Expense)		(10,000)	(15,000)			
<b>Total Net Income / (Loss) Annual</b>		<b>16,397</b>	<b>(281,775)</b>			
<b>Biennium Gain/(Loss)</b>			<b>(265,378)</b>			
19July2021 LMS						

			1				A 20/21	
			2018 / 19		Delta		2020/2021	
			Total Budget	% Change			Total Budget	Unspent Project
	<b>Division</b>							Jan31 Actual
I	I Physical and Biophysical		56,700	-4.22%	(2,500)		37,721	32751
II	II Inorganic		46,100	-5.14%	(2,500)		31,043	20143
III	III Organic and Biomolecular		45,400	-5.22%	(2,500)		30,602	20102
IV	IV Polymer		47,200	-5.03%	(2,500)		31,736	26736
V	V Analytical		50,800	-4.69%	(2,500)		34,004	28504
VI	VI Chemistry and the Environment		57,300	-4.18%	(2,500)		38,099	29974
VII	VII Chemistry and Human Health		52,300	-4.56%	(2,500)		34,949	24184
VIII	VIII Chemical Nomenclature and Structure Representa		67,900	-3.55%	(2,500)		44,777	39777
	<b>Total Divisions</b>		<b>423,700</b>	<b>-4.51%</b>	<b>(20,000)</b>		<b>282,931</b>	<b>222,171</b>
								83%
	<b>Standing Committee</b>							
A	Executive		44,000	0.00%	-		-	
A	Bureau		55,000	38.19%	15,200		-	
O	CHEMRAWN		20,000	-27.27%	(7,500)		-	
A	CPCDS		22,200	37.04%	6,000		30,000	
O	CCE		37,000	4.23%	1,500		35,000	
O	COCI		35,000	-5.41%	(2,000)		26,000	
A	Finance		16,000	21.21%	2,800		16,000	
A	ICTNS		3,500	0.00%	-		-	
A	Centenary Endowment Board							
A	Evaluation Comm		-	0.00%	-		-	
O	ICGCSD		21,000	0.00%	21,000		26,000	
	<b>Total Standing Committees</b>		<b>253,700</b>	<b>17.07%</b>	<b>37,000</b>		<b>135,000</b>	
	<b>Total: Divisions and Committees</b>		<b>677,400</b>				<b>417,931</b>	
P	Project Committee (Reserve)		70,000	0.00%	-		90,000	
P	FSC		30,000	0.00%	-		20,000	
A	ON		20,000	0.00%	-		20,000	
OT	Chemistry Olympiad		5,000	100.00%	2,500		5,000	
OT	IUPAC – Solvay Prize		10,000	0.00%	-		10,000	
OT	General Assembly		390,000	-3.70%	(15,000)		330,000	
OT	Centenary		50,000	0.00%	50,000		-	
OT	International Year (IYBSSD) €		-	0.00%	-		-	
OT	ICSU/IMU/IUPAC Grant		22,000	100.00%	11,000		-	
	<b>Total Other Commitments</b>		<b>597,000</b>	<b>8.84%</b>	<b>48,500</b>		<b>475,000</b>	
				<b>(B / A) - 1 = C</b>			<b>A</b>	
	<b>Total Commitments</b>		<b>1,274,400</b>	<b>5.42%</b>	<b>65,500</b>		<b>892,931</b>	

2022 (30%)			2023 (70%)			Total Project	Total Operations	2022/2023
	0.3	0.7		0.3	0.7	3,500 less 20/21	Flat to 2K	Total Budget
Total	Oper	Projects	Total	Oper	Projects			
-			23,955	2,000	21,955	21,955	2,000	23,955
-			19,280	2,000	17,280	17,280	2,000	19,280
-			18,971	2,000	16,971	16,971	2,000	18,971
-			19,765	2,000	17,765	17,765	2,000	19,765
-			21,353	2,000	19,353	19,353	2,000	21,353
-			24,219	2,000	22,219	22,219	2,000	24,219
-			22,014	2,000	20,014	20,014	2,000	22,014
-			28,894	2,000	26,894	26,894	2,000	28,894
-			178,452	16,000	162,452	162,452	16,000	178,452
22,000	22,000	-	-	-	-		22,000	22,000
65,000	65,000	-	-	-	-		65,000	65,000
-		10,000	7,000	2,000	5,000	5,000	2,000	7,000
-		25,000	17,500	2,000	15,500	15,500	2,000	17,500
-		30,000	21,000	2,000	19,000	19,000	2,000	21,000
-		22,000	15,400	2,000	13,400	13,400	2,000	15,400
	-	-	16,000	16,000	-	-	16,000	16,000
-	-	-	-	-				-
14,000	14,000	-	-				14,000	14,000
-	-	-	-	-	-			-
		23,000	16,100	2,000	14,100	14,100	2,000	16,100
101,000	101,000	110,000	93,000	26,000	67,000	67,000	127,000	194,000
						229,452	143,000	372,452
-		80,000	40,000		40,000	40,000		40,000
-		10,000	10,000		10,000			10,000
-		20,000	14,000	14,000		14,000		14,000
2,500	2,500		2,500	2,500				5,000
-	-		10,000	10,000				10,000
5,000	5,000		300,000					305,000
-	-		-	-				-
6,000	-		6,000	-				12,000
-	-	-	-	-	-			-
13,500	7,500	110,000	382,500	26,500	50,000			396,000
106,000	114,500	108,500	603,452	653,952	68,500			768,452
Travel 1			Travel 2					A+B=C

Travel Alloc calc

	<b>2018</b>	<b>2019</b>
Travel and Meetings expenses	433,260.97	567,067.01
IUPAC Travel Budget	412,810.00	861,590.00

Actual		2018	%	2019	%	18/19 Total	%
Airfare & trans – officers	68322	31,353.32	7.50%	29,984.36	5.58%	61,337.68	6.42%
Airfare & trans – staff (Comm)	68323	7,076.48	1.69%	8,864.83	1.65%	15,941.31	1.67%
Airfare & trans – staff (Sec)	68324	4,057.71	0.97%	6,043.14	1.13%	10,100.85	1.06%
Airfare & trans – members	68325	216,905.32	51.88%	254,748.79	47.45%	471,654.11	49.39%
Hotel & subs – officers	68332	16,909.13	4.04%	18,538.11	3.45%	35,447.24	3.71%
Hotel & subs – staff (Comm)	68333	8,893.17	2.13%	1,710.46	0.32%	10,603.63	1.11%
Hotel & subs – staff (Sec)	68334	432.76	0.10%	9,792.51	1.82%	10,225.27	1.07%
Hotel & subs – members	68335	132,474.37	31.68%	207,199.97	38.59%	339,674.34	35.57%
		418,102.26	100.00%	536,882.17	100.00%	954,984.43	100.00%
		2018 P&L Non-GA year	D / D20	2019 P&L GA year	F / F20	D + F	H / H20

Actual		Actual 2018	%	Budget 2018	Actual Staff 2018	Proj over Gov 2018	Total	%
Airfare & trans – officers	68322	31,353.32	7.80%	32,185.81			32,185.81	7.51%
Airfare & trans – staff (Comm)	68323				7,076.48		7,076.48	1.65%
Airfare & trans – staff (Sec)	68324	4,057.71	1.01%	4,165.45			4,165.45	0.97%
Airfare & trans – members	68325	216,905.32	53.94%	222,664.57			222,664.57	51.93%
Hotel & subs – officers	68332	16,909.13	4.20%	17,358.10			17,358.10	4.05%
Hotel & subs – staff (Comm)	68333				8,893.17		8,893.17	2.07%
Hotel & subs – staff (Sec)	68334	432.76	0.11%	444.25			444.25	0.10%
Hotel & subs – members	68335	132,474.37	32.94%	135,991.82			135,991.82	31.72%
		402,132.61	100.00%	412,810.00			428,779.65	#####
			D / D39	E * C4 Apply actual %s to Budgeted		PLUS Surplus of Project Funds over Officers Governance Sec Staff travel for Comm meetings unbudgeted		H / H39

Division & Standing Committee Allocations			
	\$ 106,000.00	\$ 603,451.70	
Average	Proposed	Proposed	
Proposed 22/23	2022	2023	Total
7.302%	7,739.66	44,061.41	51,801.06
1.449%	1,536.41	8,746.71	10,283.13
0.995%	1,055.03	6,006.22	7,061.25
51.615%	54,711.39	311,468.68	366,180.07
61.361%			
3.993%	4,232.49	24,095.32	28,327.81
1.602%	1,698.11	9,667.26	11,365.37
0.319%	338.29	1,925.86	2,264.15
32.725%	34,688.62	197,480.25	232,168.87
38.639%			
100.000%			
Total	106,000.00	603,451.70	709,451.70

Proposed 2022	Proposed 2023
7.51%	7.10%
1.65%	1.25%
0.97%	1.02%
51.93%	51.30%
4.05%	3.94%
2.07%	1.13%
0.10%	0.53%
31.72%	33.73%
100.00%	100.00%
H / H39	average of all percentages E + G + E + I / 4

## 11.2 National Subscriptions 2022-2023

Country	2020 NS	2021 NS	2022 NS	2023 NS
Australia	\$11,318.00	\$11,657.00	\$12,007.00	\$12,367.00
Austria	\$7,261.00	\$7,479.00	\$7,703.00	\$7,934.00
Bangladesh	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
Belgium	\$17,694.00	\$17,163.00	\$16,648.00	\$16,148.00
Bulgaria	\$2,033.00	\$2,094.00	\$2,156.00	\$2,221.00
Canada	\$16,219.00	\$16,706.00	\$17,207.00	\$17,723.00
Chile	\$8,229.00	\$7,982.00	\$7,807.00	\$7,807.00
China/Beijing	\$144,474.00	\$147,045.00	\$147,045.00	\$147,045.00
China/Taipei	\$29,147.00	\$28,273.00	\$27,425.00	\$26,602.00
Costa Rica	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
Croatia	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
Czech Republic	\$6,107.00	\$6,290.00	\$6,478.00	\$6,673.00
Denmark	\$4,912.00	\$5,059.00	\$5,211.00	\$5,367.00
Egypt	\$1,589.00	\$1,637.00	\$1,686.00	\$1,737.00
Finland	\$6,629.00	\$6,827.00	\$6,856.00	\$6,856.00
France	\$33,916.00	\$33,916.00	\$33,916.00	\$33,916.00
Germany	\$51,636.00	\$51,636.00	\$51,636.00	\$51,636.00
Greece	\$3,531.00	\$3,637.00	\$3,746.00	\$3,858.00
Hungary	\$4,671.00	\$4,811.00	\$4,956.00	\$5,104.00
India	\$31,467.00	\$32,411.00	\$33,384.00	\$34,385.00
Ireland	\$5,605.00	\$5,773.00	\$5,946.00	\$6,124.00
Israel	\$10,743.00	\$10,421.00	\$10,108.00	\$9,805.00
Italy	\$25,738.00	\$25,738.00	\$25,738.00	\$25,738.00
Jamaica	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
Japan	\$48,983.00	\$50,452.00	\$51,966.00	\$53,525.00
Jordan	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
Korea, Republic of	\$43,136.00	\$41,841.00	\$40,586.00	\$39,369.00
Kuwait	\$1,073.00	\$1,105.00	\$1,138.00	\$1,172.00
Malaysia	\$9,475.00	\$9,475.00	\$9,475.00	\$9,475.00
Nepal	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
Netherlands	\$23,751.00	\$23,039.00	\$22,347.00	\$21,677.00
New Zealand	\$3,587.00	\$3,695.00	\$3,805.00	\$3,920.00
Nigeria	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
Norway	\$5,767.00	\$5,940.00	\$6,118.00	\$6,302.00
Poland	\$10,343.00	\$10,653.00	\$10,973.00	\$11,302.00
Portugal	\$5,014.00	\$5,164.00	\$5,319.00	\$5,479.00
Puerto Rico	\$5,015.00	\$5,015.00	\$5,015.00	\$5,015.00
Russia	\$26,692.00	\$25,892.00	\$25,115.00	\$24,483.00
Senegal	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
Serbia	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
Singapore*	\$12,465.00	\$12,465.00	\$12,465.00	\$12,465.00
Slovakia	\$3,019.00	\$3,110.00	\$3,203.00	\$3,299.00
Slovenia	\$2,432.00	\$2,505.00	\$2,580.00	\$2,657.00
South Africa	\$7,136.00	\$7,350.00	\$7,513.00	\$7,513.00
Spain	\$20,949.00	\$20,949.00	\$20,949.00	\$20,949.00
Sri Lanka	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
Sweden	\$7,539.00	\$7,765.00	\$7,998.00	\$8,238.00
Switzerland	\$12,002.00	\$11,642.00	\$11,305.00	\$11,305.00
Thailand	\$9,983.00	\$9,683.00	\$9,393.00	\$9,111.00
Turkey	\$6,415.00	\$6,608.00	\$6,806.00	\$7,010.00
United Kingdom	\$26,499.00	\$27,294.00	\$28,113.00	\$28,956.00
United States	\$115,418.00	\$115,269.00	\$115,269.00	\$115,269.00
Uruguay	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
<b>Total NS</b>	<b>\$840,612.00</b>	<b>\$844,466.00</b>	<b>\$846,110.00</b>	<b>\$848,537.00</b>

\*2019 Council Approved

## **ICGCSD**

### **Composition and Terms of Office**

- (i) There shall be a standing Interdivisional Committee on Green Chemistry for Sustainable Development, composed of a Chair, a Secretary, up to three Titular Members and up to three Associate Members as a “core” membership, up to eight National Representatives, and one Representative Member from each interested Division and Standing Committee.
- (ii) The President, in consultation with the Executive Committee, shall appoint the Chair, Secretary, Titular Members, Associate Members, and National Representatives. The ICGCSD, Division Presidents and Standing Committee Chairs may propose names of persons suitably qualified for appointment and should conduct elections according to the pattern for Divisions, in order to inform the advice that they give to the President.
- (iii) The period of service of Titular Members, Associate Members and National Representatives shall be two years, renewable for a further term of two years. The period of service of Representatives from the Divisions and Standing Committees shall be two years, subject to re-nomination and reappointment to a maximum period of service of eight years.

Etc.

## Council Item 15.1

### 1. Centenary Endowment Board.

#### Composition and Terms of Office:

##### (a) Purpose.

- i. There shall be a Centenary Endowment Fund that will provide a mechanism through which Fund Donors can support and engage in IUPAC's international work into its second century of existence.
- ii. There shall be a standing Centenary Endowment Board, comprised of three externally recruited members, a member from the IUPAC Finance Committee. In addition, the IUPAC Treasurer or alternate IUPAC Officer and Executive Director (to act as Secretary) shall be *ex officio* members but without voting power.
- iii. The Centenary Endowment Board will report to the IUPAC Executive Committee with reference to the discharge of the Board's duties and any recommendations it may have.
- iv. The Centenary Endowment Board shall be responsible for and shall administer IUPAC's funds solicitation efforts and the development of the Fund and recommending disbursement in accordance with the Fund Mission and, where relevant, specific designations by Donors.
- v. It shall recommend to the Executive Committee policies for accepting, receiving, and investing permanent funds and endowments from Fund Donors that are consistent with IUPACs charitable status and international standing.
- vi. The Centenary Endowment Board shall also review the Fund Policies as needed and recommend modifications and/or amendments to the Executive Committee for their approval.
- vii. The Centenary Endowment Board may recommend to the Executive Committee specific goals and/or projects for which funding is available.
- viii. The Centenary Endowment Board will consider the current investment policies of the Finance Committee to ensure these have an acceptable risk profile based on goals for the Fund and may require the Finance Committee to manage the invested Fund investments accordingly. The Fund will bear the additional investment costs that may arise from changes in the investment risk profile.

##### (b) Composition and Term of Centenary Endowment Board Members.

- i. The Board Members shall be appointed by the Executive Committee. Board Members shall serve for a term of three (3) years on a rotating basis, such

that one (1) Board Member will rotate off each year. (Inaugural members may be appointed to two, three and four years to effectuate this requirement.) Centenary Endowment Board Members may be reappointed to serve up to four consecutive terms.

- ii. Board Members may be removed by the Executive Committee only for actions or activities inconsistent with IUPAC's charitable status and values or that are inconsistent with the Fund Mission.
- iii. Any vacancies created by the resignation, removal or death of a Board Member shall be filled by the Executive Committee, which member shall complete the term of the vacating member.
- iv. The Centenary Endowment Board shall meet at least quarterly
- v. The members of the Centenary Endowment Board shall annually elect a Chair from among the external Board Members, by majority vote. The Chair may be elected to consecutive terms, without limit, so long as he or she is a member of the Board. The Chair's responsibilities shall include, but are not limited to, convening and presiding at meetings, serving as the Centenary Endowment Board's liaison to the Executive Committee, and ensuring donor questions/inquiries regarding the status of a gift or bequest are addressed by the IUPAC Secretariat.

## 15.2 Standing Committee on Ethics, Diversity, Equity, and Inclusion (CEDEI)

The mission of CEDEI is to promote and develop the core values stated in the IUPAC strategic plan, mainly: to strive for diversity and inclusiveness in all forms, to respect each other and the Union, and to uphold the highest standards of transparent, responsible and ethical behaviour. The role of this Committee includes to provide advice, recommend best practices, and develop policies to ensure that IUPAC promotes and embraces equity, diversity, and inclusion in the workspace, in publications, and in education in

chemistry. While acknowledging that many organizations connected to IUPAC may already have their own in-house policies, this committee may also produce and collect examples of best practices, guidelines, and recommendations for the use of IUPAC and the chemistry community as a whole on these subjects. This independent Committee should also produce a whistle-blower policy and serve as a confidential and safe point of contact for anyone who may feel harassed or discriminated against or who has witnessed a behaviour inconsistent with the values, mission, and strategic plan of the Union. Finally, CEDEI can, at the request of the President of the Union, provide an independent opinion on any topic related to its mandate.

### Terms of Reference

- i. To provide independent advice to the President, Executive Committee, Executive Director, other Standing Committees, Divisions, and Commissions on matters relating to ethics, diversity, equity and inclusion within the policies, business and activities of the Union, or when undertaken by volunteers on behalf of the Union;
- ii. To make recommendations to the President and the Executive Committee, where appropriate, on matters relating to ethics, diversity, equity and inclusion within the policies, business and activities of the Union, or when undertaken by volunteers when engaged in business or activity on behalf of the Union;
- iii. To develop in-house policies on ethics, diversity, equity and inclusiveness that are in accord with the IUPAC strategic plan, which are widely publicized on the IUPAC website(s), and which act as a reference point for the behaviour of IUPAC members, volunteers and staff when engaged in activities or business on behalf of the Union;
- iv. To provide confidential advice or act as a confidential point of contact for IUPAC members, staff and volunteers, when engaged in business or activity on behalf of the Union, where an incident inconsistent with the Mission and Core Values of IUPAC may have occurred;
- v. To establish, subject to approval by the President and Executive Committee, Advisory Boards, Subcommittees, and Working Groups as needed to carry out specific functions of the committee.

### Composition and Terms of Office

- i. There shall be a standing Committee on Ethics, Diversity, Equity and Inclusion (CEDEI), composed of a Chair, a Secretary, and 4 other Titular Members. The Executive Director shall be an *ex officio* member of the committee.
- ii. The President, in consultation with the Executive Committee, shall appoint the Titular Members. The Standing Committee on Ethics, Diversity, Equity and Inclusion (CEDEI) may propose names of persons suitably qualified for appointment.
- iii. The period of service of a Titular Member shall be two years, renewable for a further term of two years.
- iv. The Membership shall be reviewed every two years by the incoming President, in consultation with the Executive Committee.
- v. The President, in consultation with the Executive Committee, shall appoint the Chair. The Chair shall appoint a Secretary. The Committee on Ethics, Diversity, Equity and Inclusion (CEDEI) may propose candidates.

- vi. The period of service of the Chair shall not exceed 2 years. The sum of the years of service as a Titular Member and as the Chair shall not exceed 4 years.
- vii. The period of service of the Secretary shall not exceed 2 years. The sum of the years of service as a Titular Member and as the Secretary shall not exceed 4 years.
- viii. The maximum term of service for any individual Member of the Committee on Ethics, Diversity, Equity and Inclusion shall not exceed 4 years.



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

Item Number(s)

Salutation First Last

17      Summary of IUPAC Organisational Structure Review Report and Actions Taken  
Professor Christopher Brett

Council approved a motion at the 2019 IUPAC General Assembly that a working group be established to undertake a complete review of the organisational structure of IUPAC. The Organisational Structure Review Group includes Dr. Mark C. Cesa (chair), Prof. Javier Garcia-Martinez (IUPAC Vice President), Prof. Ito Chao, Prof. Dr. Michael Droeschner, Prof. Lori Ferrins, and Prof. Zhigang Shuai.

The main objectives were:

- Recommending directions for the scientific work of the union going forward, and how to structure the Union to achieve its scientific objectives.
- Recommending ways of working that would reduce costs and improve efficiency.

The Review Group carried out its extensive work during 2020, which included conducting a wide-ranging survey of stakeholders, of scientific and financial aspects and emerging trends and advances in the chemical sciences. It submitted its report, with 4 appendices, to the Executive Committee in November 2020, who discussed and approved it, and the final report, dated 9<sup>th</sup> December 2020, was circulated to Bureau in December 2020.

In January 2021, two on-line Bureau meetings were held, on 9<sup>th</sup> and 23<sup>rd</sup> January 2021, to discuss the recommendations made in the report and how they could be implemented, if that were the wish of Bureau and decision of Council. It was decided to concentrate on the proposed alterations to governance structure and whether these would lead to greater agility and be effective in adapting and reacting rapidly to change. The Elected Members of Bureau on the one hand, and the Division Presidents (DPs)/Standing Committee Chairs (SCCs) on the other, discussed their points of view between the Bureau Meetings. The proposed change in governance structure involves replacing Bureau with an Executive Board (EB) and a Science Board (SB).

It was necessary to decide in January whether changes to Statutes and Bylaws would be proposed to Council at its meeting in August 2021, since the deadline for receipt of proposals for such changes was mid-February 2021. It was concluded that, given the need for extensive internal discussion and consensus within Bureau, that no proposals from Bureau for changes to the Statutes and Bylaws (S&B) regarding governance structure could be made at that time.

6 July 2021

Dear National Adhering Organisations,

The Executive Committee (EC) has reviewed the recommendations of both the Review Group and the attached discussion paper from Bureau Working Groups that were established to consider implementation of the recommendations. The EC feels that it is important to ensure full discussion and have a broad consensus if IUPAC is to embark on a process of change. The EC therefore welcomed the Bureau Working Groups contribution to this.

The EC fully endorsed the original recommendations from the Review Group and in particular the creation of a Science Board to drive the science strategy. The current Bureau, whilst inclusive, is very large and experience has shown that it is not a good forum for setting science priorities. This is a role largely delegated to the Divisions and Standing Committees.

We feel it is vital that:

1. The Science priorities and the way IUPAC addresses them must evolve in a more agile and responsive way, given the pace of change in the world today.
2. IUPAC must reduce the costs that derive from the complexity of our current organisation and processes. We need to simplify, focus and reduce the need for international travel if we are to be financially sustainable. We have to be able to show we spend scarce resources (money and volunteer time) wisely and efficiently if we are to attract additional funding and donations.

Any final proposals for change must, in our view, consider both these points and it is essential that the value of any proposed changes is measured against these criteria.

The Bureau Working Groups rightly considered governance as the driver for change. In considering the attached discussion paper the EC recommends that NAOs consider a number of questions and issues including:

- The future strategic role of the officers elected by Council
- The relationship between the Executive Board and the Science Board. Is there potential for constructive tension or alternatively could this lead to conflict between the two boards? The EB would be directly elected by Council. Should the SB be similarly elected?

- The make-up of the Science Board. Should this be the current Division Presidents and Standing Committee Chairs, or might this enshrine the current science organisation? How might objective external perspectives be introduced?
- The emerging implementation proposals are for relatively large boards to ensure inclusivity, but are there better ways to retain inclusivity whilst ensuring speed of decision-making and lower costs?

We will be organising discussion forums to facilitate NAO participation and engagement during the General Assembly. In the meantime, we welcome your views and perspectives by Email.

Yours sincerely,

A handwritten signature in blue ink that reads "Christopher M. A. Brett". The signature is written in a cursive, flowing style.

Prof. Christopher Brett

President IUPAC



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

The internal discussions, dividing the Bureau into three working Groups, each comprising Elected Members and DPs/SCCs. Following this, the coordinators of the three Working Groups prepared a briefing discussion document regarding alterations to the governance structure that was discussed with Bureau members in videoconferences in June 2021. The final version of the document, together with a cover letter outlining the opinion of the Executive Committee and crucial questions to be considered was sent to Council members in early July 2021. Three videoconference engagement sessions with NAOs have been arranged to take place during the Montreal General Assembly, on 9<sup>th</sup>, 10<sup>th</sup> and 11<sup>th</sup> August at different times of day/night, given the wide span of time zones of NAO delegates. The answers to the important questions on governance structure and composition of the EB and SB etc. and the resulting suggestions will enable a proposal for changes to the Statutes and Bylaws to be formulated and discussed, the final version being ready before the end of 2021.

This proposal for changes to the S&B to implement the new governance structure will then be the basis of a request from the Bureau Chair to the Secretary General to call a Special Council Meeting. Following this request, the President will call a special Council meeting in 2022 in order to vote on the necessary changes to the Statutes and Bylaws.

## **IUPAC Organizational Structure Review Group**

Rationale: As IUPAC moves into its second century, the Union will establish a working group to undertake a complete review of its organizational structure. This ad-hoc working group was approved by Council in 2019.

### Composition and Terms of Office

- (i) There shall be an Organizational Structure Review Group composed of six members.
- (ii) The President shall appoint the members, in consultation with the Executive Committee.
- (iii) The President shall appoint a Chair of the review group from among the members, in consultation with the Executive Committee.
- (iv) The membership will comprise the Vice President/President Elect and five other members who bring a breadth of perspectives about the Union, the field of chemistry, the scientific enterprise, and strategic and organizational management experience, taking into account diversity in geography, gender, age and other criteria.
- (v) The Review Group will begin its deliberations in January, 2020; will finalize its recommendations by the end of 2020; and will complete its work no later than the end of 2021.

### Terms of Reference

- (i) To undertake a complete review of the organizational structure of IUPAC, with respect to its ability to achieve its scientific objectives, reduce costs and improve efficiency.
- (ii) To make recommendations for the Union to optimize its structure, functions and processes for the future, based on this review and examination of best practices among similar organizations in the rapidly advancing field of chemistry
- (iii) To carry out its work at one face-to-face meeting early in 2020 and otherwise by electronic means (e-mail, conference calls, etc.)
- (iv) To report to the Bureau, in writing, at its April meeting in 2020 and at other times as required, and to report formally to Council at its meeting at the IUPAC General Assembly in 2021.

# Organizational Structure Review Group Report

## 9 December 2020

### I. Executive Summary

Following is a summary of the work and recommendations of the IUPAC Organizational Structure Review Group: Dr. Mark Cesa (USA, Chair, 2014-2015 President of IUPAC and member of the IUPAC Finance Committee), Prof. Ito Chao (China/Taipei), Prof. Dr. Michael Driescher (Germany), Prof. Lori Ferrins (Australia, IYCN), Prof. Zhigang Shuai (China/Beijing) Prof. Javier Garcia Martinez (Spain, IUPAC Vice President, *ex-officio*).

The review group organized its work along two major lines:

1. Recommending directions for the scientific work of the Union going forward, and how to structure the Union to achieve its scientific objectives;
2. Recommending ways of working that would reduce costs and improve efficiency.

To gather information, the review group carried out a survey of IUPAC stakeholders; reviewed Secretariat operations and consulted with the Executive Director; reviewed emerging trends and advances in the chemical sciences; examined the organizational structure of several other scientific unions and related organizations, and took into account the report of the Finance Committee Options Work Group and other prior IUPAC initiatives on structural changes.

Overall, there were several common trends amongst the responses to the survey. Respondents suggested that IUPAC should:

- be more responsive, adjusting priorities in response to the rapidly changing scientific environment and culture;
- remain focused in the core activities of IUPAC but include an emphasis on emerging areas in the chemical sciences;
- embrace technology in the day-to-day operation of the Union;
- promote social equity and diversity in the chemistry community;
- increase the visibility of the Union such that we can recruit top chemists to contribute to the activities of the Union;
- be more communicative in all facets of IUPAC's business; increase communication with NAOs, Associate Organizations, and members.

An examination of emerging trends and topics in research in the chemical sciences identified future directions in synthetic chemistry; catalytic chemistry; chemical theory, mechanism and computation; materials chemistry and energy chemistry; chemical detection and measurements; chemical biology; environmental chemistry; and industrial chemistry and chemical engineering. Additionally, the 2019 and 2020 Top Ten Chemical Technologies illustrate the application of interdisciplinary approaches to solving important world problems.

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## Organizational Structure Review Group Report

### Recommendations

The review group has prepared a set of recommendations on the structure and the functions of IUPAC. The organisational structure proposed here delineates clearly distinct areas of responsibility for each governing body so that both governance responsibilities and the scientific work of IUPAC are weighted equally in importance and are overseen by appropriate experts, with oversight by Council. The structure is intended to facilitate decision making, timely scientific contributions, and engagement by all stakeholders. Structural recommendations are made for governance and the Secretariat, and recommendations of a functional nature are proposed for membership relations and for communications with stakeholders and the chemistry community.

### Governance

The review group recommends replacing the current Bureau-Executive Committee structure with two governance Boards that cover administrative matters and the science.

**Executive Board (EB):** This Board is responsible for decisions and execution of the administrative matters of the Union. The EB shall include the 5 Officers of the Union (President, Vice President, Immediate Past President, Secretary General, and Treasurer) plus 6 elected members, of which 5 are nominated by the NAOs and elected by the Council, and one is the Chair of the DP-SCC Board. The Executive Director is an *ex-officio* non-voting member of the EB.

**Division-Standing Committee Board (DP-SCC):** This Board is responsible for the scientific direction, activities, and contributions of the Union. Division Presidents and Standing Committee Chairs are the members of this Board. The Executive Director and Secretary General are *ex-officio* non-voting members of this Committee.

**Council:** Membership and voting procedures of the Council shall be as described in the current Statutes and Bylaws. The Council can meet electronically in “off years” (years in each biennium in which the General Assembly is not scheduled), and the primary biennial Council meeting is held every 2 years, preferably but not necessarily in conjunction with the General Assembly and IUPAC Congress. A face-to-face meeting is preferred for biennial Council meetings but meeting electronically or by hybrid means is also permitted. In addition to governance matters, the Council can discuss one or more emerging issues that affect the Union, particularly scientific matters.

### Science – Divisions and Standing Committees

**Divisions:** The review group recommends maintaining the current overall divisional structure for the time being, but it is also recommended that the Divisions and Standing Committees form a working group to review the Division and Standing Committee structure in the light of current needs and emerging trends in chemistry and propose any changes to the Division and Committee structure as needed for decision and implementation in time for the 2024-2025 biennium.

## Organizational Structure Review Group Report

**Standing Committees:** Three new Standing Committees (Ethics; Diversity, Equity and Inclusion; and History of Chemistry and Archiving) are proposed, following in part on suggestions from the auditors. It is recommended that creation of these Committees be submitted for approval by the 2021 Council so that they can begin their work in the 2022-2023 biennium.

Additionally, modified roles for several existing Standing Committees are recommended. In particular:

- The responsibilities of the Project Committee should include review of completed projects on a regular basis to assure timeliness, effectiveness and compliance with the IUPAC Strategic Plan.
- Responsibilities of the Evaluation Committee should include evaluating the performance of the Divisions and Standing Committees in view of the mission and strategic plan, with a special focus on constructive guidance.
- CHEMRAWN should include a focus on cooperation between IUPAC and international organisations and initiatives such as UNESCO, UN SDGs, etc. to identify critical world needs and recommend involvement by the relevant Divisions and Standing Committees.
- ICGCSD should encourage interdivisional projects in the area of sustainable development.

### The Secretariat

The Secretariat performs indispensable functions for IUPAC, including sound management of the finances of the Union. The following recommendations and suggestions are intended both to enhance the contributions of the Secretariat but also, over time, to decrease costs.

- Evaluate suitability of a virtual or hybrid office model.
- If hybrid/in-person preferred, consider location in order to balance staff retirements, with synergies on costs and staff expertise (within 2-5 years).
- Complete skills assessments for current staff.
- Complete the work to move away from paper to electronic handling of data and materials
- Consider viability of outsourcing certain activities/responsibilities.
- Strengthen expertise at the Secretariat focused on Communications, including web, social media, and public outreach.
- Strengthen expertise at the Secretariat focused on Information Technologies, including virtual meeting technologies; and branding/promotion, including the IUPAC shop.
- Consider utilisation of volunteers or interns to help on administrative tasks that do not require specialist expertise; e.g. *ad hoc* group to organise archival files and similar materials, internship program.
- Complete the work on establishing an Endowment Fund and a mechanism for allowing for charitable donations.
- Assess whether IUPAC should negotiate a fixed amount (as per prior arrangement) from conference organisers for endorsed conferences.

## Organizational Structure Review Group Report

### Communications

Improved communication was one of the most strongly emphasised needs among the responses to the survey.

Two new global Forums are recommended:

- **NAO Forum:** This Forum is a yearly electronic meeting with representatives of each NAO and ANAO to provide an opportunity to interact with leadership, asking questions etc. Topics for discussion may include mutual activities among the NAOs, emerging issues facing the Union, and other similar matters.
- **Presidents Forum:** An annual meeting (online in off-years and in-person in years with GA) with the presidents of all global chemical societies. This is a strategic opportunity, as the chemical societies never meet, besides in regional meetings, as an occasion for IUPAC to exercise its convening role in global chemistry to show leadership and coordination of international initiatives.

### Communication with Stakeholders

- Establish an IUPAC newsletter that is freely distributed to all stakeholders.
- Prepare a biennial report for NAOs and other stakeholders on activities in IUPAC
- Make Chemistry International more widely accessible.
- Develop a process for communication with NAOs that assures the proper person/s are receiving and acknowledging communications from IUPAC.

### Web site

- A short video introduction from the IUPAC President.
- On the contact us page, add a link to the secretariat page.
- Add bullet point descriptions for primary task responsibilities to the secretariat staff biographies.
- Become a hub of information about current topics of interest (SDGs) or rapidly evolving situations (COVID-19).
- Host webinars in collaboration with other international groups i.e. NAOs

### Membership

Following are recommendations and suggestions for enhancement of the experiences of IUPAC volunteers in response to requests and observations in the responses to the survey.

- Create a handbook for volunteers.
- Recognize volunteers' service.
- Establish a database of active volunteers within the Union.
- Overhaul the various individual membership options to consider different membership categories and fees depending on whether you come from industry/academia/student.
- Publicise membership options *and* benefits.

Regarding recommendations for the Secretariat, Communications, and Membership above, the review group acknowledges that there are current activities and initiatives already under way that

## Organizational Structure Review Group Report

are consistent with several of these recommendations. We hope that our recommendations will serve to reinforce these ongoing efforts and to highlight their importance to IUPAC.

The work of the review group and its recommendations are described in detail in the body of this Report.

### II. Introduction and Background

At the IUPAC Council meeting in 2019, Congress voted to establish a working party to “undertake a complete review of the organizational structure of IUPAC,” and that this working party should “develop proposals for the future organization of IUPAC,” for discussion during the 2020-2021 biennium and a vote at the 2021 Council meeting (*Chem. Intl.*, April-June 2020, p. 22). The IUPAC Organizational Structure Review Group was officially established in early 2020 and includes the following members: Dr. Mark C Cesa, (USA, Chair, 2014-2015 President of IUPAC and member of the IUPAC Finance Committee), Prof. Ito Chao (China/Taipei), Prof. Dr. Michael Droescher (Germany), Prof. Lori Ferrins (Australia, IYCN), Prof. Zhigang Shuai (China/Beijing) Prof. Javier Garcia Martinez (Spain, IUPAC Vice President, *ex-officio*). The review group established Terms of Reference and initiated a project to cover its work (<https://www.iupac.org/project/2020-007-1-020>).

The review group has met at regular intervals electronically, and organized its approach along two major lines:

1. Recommending directions for the scientific work of the Union going forward, and how to structure the Union to achieve its scientific objectives;
2. Recommending ways of working that would reduce costs and improve efficiency.

To inform the review group and to aid in making recommendations, the following sources of information were used:

1. A survey of IUPAC stakeholders, including NAOs, AOs, Associated Organizations, Titular Members, Associate Members and National Representatives of Division Committees and Standing Committees, Affiliate Members, and other persons in the global chemistry community. The survey and the responses are included in this report in Appendices I - III. Further discussion of the survey and its results appears in Section III of this report.
2. Interviews with the Executive Director on the composition, tasks and responsibilities of the IUPAC Secretariat. These discussions gave the review group a greater understanding of the contributions, responsibilities and challenges at the Secretariat and provided the basis for recommendations in Section V of this report.
3. A review of emerging trends and advances in the chemical sciences. This work included a summary of top scientific challenges, identified by Prof. Shuai and Prof. Dr. Droescher (Appendix IV), and the IUPAC Top Ten Emerging Chemical

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Technologies for 2019 and 2020. Further description of this work appears in Section IV of this report.

4. A review of the organizational structure of several other international scientific unions, via their web sites, to identify possible good practices, which also provided ideas for recommendations in Section V of the report.
5. The prior report by the Finance Committee Options Work Group, and other prior IUPAC initiatives on structural changes.

### III. The Survey

A survey was prepared to assess the thoughts of the wider chemistry community on the impact, scope and activities of IUPAC. The survey was circulated by email to 1724 stakeholders: attendees the IUPAC council meeting in 2019, NAOs, ANAOs, Associated Organizations, Bureau members, Company Associates, Division Committee members, Standing Committee members, project task group chairs and members, and Commission members. By the deadline, 447 respondents from 60 NAOs and other countries had submitted their feedback. Subsequently, NAOs were invited to submit responses to the survey to ensure that their views, in addition to those of individual stakeholders, were considered. The views of the seven NAOs who responded to this request and the individual stakeholders were in general agreement and, as such, have been considered together. The survey, a compilation of survey responses, and a compilation of responses from seven NAOs are included in this report as Appendices I, II and III, respectively. An Excel spreadsheet with the raw data from the survey will be available at the Secretariat.

Responses to the survey included many observations and suggestions for useful and concrete improvements, but they also included some comments that revealed that current processes, Union bodies, or practices were not well known to some respondents. The responses to the survey should be considered carefully in this light.

There was a good consensus that defining nomenclature, terminology and symbols is a uniquely valued ongoing activity that IUPAC performs, and one of the most important contributions to the chemistry community that IUPAC makes. Respondents also believe that IUPAC plays an important role in the identification and sharing of key chemical technologies, building capacity worldwide, providing networking opportunities and catalyzing the formation of interdisciplinary collaborations. Setting and recommending other standards were also seen by many to be another unique feature of the Union. A number of respondents called for IUPAC to increase its collaboration with major scientific organizations, and some acknowledged that the current organizational structure may pose challenges for IUPAC to adapt to the rapidly changing world.

Some respondents expressed concern that the project system as it stands currently may not be maintainable in the long-term because they perceive that there are insufficient funds to cover the vast array of projects. The diverse portfolio of projects is perceived to dilute the scientific impact as seen by the larger chemistry community, and this is further exacerbated by regular turn-over of those in leadership positions, leading to changing priorities. A number of people also commented that the project system does not seem to have enough checks and balances to ensure

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timely completion of projects, or meeting the goals that were described in the initial submission (or describe why plans deviated from what was approved). Examination of completed IUPAC projects is needed to determine their value to the scientific community, and is a way to provide a measure of the project system and its effectiveness.

Many respondents appeared to be aware of the financial strain that IUPAC is currently under. Survey respondents had a number of ideas regarding how to decrease the operational costs of IUPAC, and how to go about raising additional revenue. Broadly, the respondents identified several categories of expenses that could be targeted to reduce the operational costs of the Union. Many of these were consistent with other suggestions such as moving towards online meetings, embracing the use of technology, relocation of the secretariat, and changes to the organizational structure and project system. Respondents typically highlighted many of the efforts that the Secretariat and officers are already implementing to increase revenue (endowment fund, the IUPAC shop), though there were also suggestions to expand opportunities to bring back workshop offerings, hiring a marketing manager and expanding/promoting the membership offerings. Some of the suggestions included involving more industrial people in divisions and task forces by taking advantage of personal contacts, and to communicate more with industry about the service and benefits that IUPAC offers to the community and the individual (e.g. the Company Associates program).

Around a third of respondents think the Union should change its organizational structure, while 27% of respondents felt ill-equipped to answer the question. There may be a slight preference among those who have been more involved (at higher levels) with IUPAC that the Union needs to change. The organizational structure of the Union is typically not at the forefront of stakeholders' minds, but it is the assessment of the review group that the structure of the Union needs to change so that the Union will be better able to accommodate the rapidly evolving field of science and to serve the needs of its stakeholders.

In terms of the scientific organization of the Union, there were several recommendations from respondents about which areas are missing from within IUPAC: for example, computational chemistry, materials science, and chemical engineering. Many also felt that IUPAC needs to refocus back to its "core" activities, particularly those that are unique to the Union. While these two ideas may seem contradictory, the review group believes that this is achievable by creating a structure of the Union that takes both core activities and emerging areas of science into account and promotes inter-divisional and -committee interactions.

There were many respondents who indicated that they wanted to see IUPAC embrace information-related technologies such as webinars, online voting, use of artificial intelligence, making color books digitally available, and open publishing. In addition, many people mentioned that IUPAC needs to incorporate IT tools into the scientific work of the Union by looking at digital data standards, artificial intelligence, online streaming (lectures and laboratories), computational chemistry, deep learning, and open data.

Just over half of respondents indicated that IUPAC is somewhat responsive (45%), or not responsive (6%) to the rapidly changing scientific environment. Other organizations have increased their visibility during the pandemic by making use of technology by running webinars and increasing their use of social media to deliver verified information. Further to this, 76% of

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respondents felt that IUPAC should be an international hub of chemical information. Through gathering information from NAOs and sharing via the IUPAC website, the Union may improve NAOs' international visibility and relevance, though this may only be achieved through close collaboration with the NAOs and other scientific organizations internationally.

Respondents were asked how IUPAC could better serve its current members and volunteers. The responses broadly fell into the following categories:

- Engagement/Assistance/Activities - provide/organize workshops, meetings, conferences, etc.; invite volunteers to Division and Standing Committee meetings (including provision of travel support); increase number of volunteers from developing countries; greater involvement in science policy development
- Information/Communication - create an historical archive of IUPAC activities; send newsletters; create awareness of activities amongst the NAOs and the broader scientific community
- Recognition - provide certificates for service; provide support to enable their participation in Union activities (including funding to attend meetings)

Overall, there were several common trends amongst the responses:

- 1) IUPAC needs to be more responsive, adjusting priorities in response to the rapidly changing scientific environment and culture;
- 2) remain focused in the core activities of IUPAC but include an emphasis on emerging areas in the chemical sciences;
- 3) embrace technology in the day-to-day operation of the Union;
- 4) promote social equity and diversity in the chemistry community (this also needs to be reflected in the structure of the Union as a whole). There was an emphasis in the respondents' comments about having a formal younger chemists' program;
- 5) increase the visibility of the Union such that we can recruit top chemists to contribute to the activities of the Union;
- 6) be more communicative - this applies to all facets of IUPAC's business; increasing communication with NAOs, Associate Organizations, and members.

### IV. Emerging Trends in the Chemical Sciences

Research in the chemical sciences is rapidly growing and changing as it incorporates interdisciplinary knowledge and as chemists collaborate with experts in other scientific and engineering fields. Prof. Shuai recruited several younger colleagues to identify newly emerging areas of scientific research in the chemical sciences. Each of Prof. Shuai's colleagues prepared a summary of new directions in synthetic chemistry; catalytic chemistry; chemical theory, mechanism and computation; materials chemistry and energy chemistry; chemical detection and measurements; chemical biology; environmental chemistry; and industrial chemistry and chemical engineering. The topics span the traditional fields of physical, inorganic, organic, analytical and polymer chemistry, and research in these topical areas draw on knowledge from related fields. These summaries are found in Appendix IV of this report.

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Additionally, the 2019 and 2020 Top Ten Chemical Technologies similarly illustrate the application of interdisciplinary approaches to solving important world problems. See (<https://iupac.org/iupac-announces-the-2020-top-ten-emerging-technologies-in-chemistry/>; *Chem Int*, 41(2), pp. 12-17, 2019; <https://doi.org/10.1515/ci-2019-0203>; and *Chem Int*, 40(4), pp. 14-17, 2018; <https://doi.org/10.1515/ci-2018-0405>).

A special topics issue of *Pure and Applied Chemistry* is in preparation on emerging issues in chemical sciences and technologies.

Finally, responses to the review group's survey suggested a range of topics that respondents believed could be incorporated into IUPAC's scientific work. They included: informatics, computational chemistry, catalysis, digital chemistry and digital tools, systems thinking, two-dimensional soft nanomaterials, meso-entropic matter, carbon chemistry, chemical engineering, materials chemistry, and chemical biology (Note that some of these topics are currently part of IUPAC's work.). Additionally, topics including societal issues and industry and in chemistry, interdisciplinarity, chemistry education, ethics, and improved communications were mentioned.

### V. Recommendations

Organisations need agile and effective structures able to adapt and react rapidly to change. The organisational structure proposed here delineates clearly distinct areas of responsibility for each governing body so that both governance responsibilities and the scientific work of IUPAC are overseen by appropriate experts, with oversight by NAOs and Council. The structure is intended to facilitate decision making, timely scientific contributions, and engagement by all stakeholders. Structural recommendations are made for governance and the Secretariat, and recommendations of a functional nature are proposed for membership relations and for communications with stakeholders and the chemistry community.

#### 1. Governance

The review group recommends replacing the current Bureau-Executive Committee structure with two governance Boards that cover administrative matters and the science. The proposed governance structure includes three governing bodies that delineate distinct areas of responsibility for administration; scientific work; and NAO decisions, information, and approval. The structure is intended to facilitate decision making, timely scientific contributions, and engagement by all IUPAC leaders and stakeholders. It is recommended that the new proposed governance structure should be submitted for approval at the 2021 Council for implementation in the 2024/2025 biennium. Detailed recommendations are described below.

- a. **Executive Board (EB):** This Board is responsible for decisions and execution of the administrative matters of the Union. The EB shall include the 5 Officers of the Union (President, Vice President, Immediate Past President, Secretary General, and Treasurer) plus 6 elected members, of which 5 are nominated by the NAOs and elected by the Council, and one is the Chair of the DP-SCC Board. The Executive Director is an *ex-officio* non-voting member of the EB.

## Organizational Structure Review Group Report

The period of service of an Elected Member should be two years, and Elected Members would be eligible for re-election to the same office for one more period of two years. Terms of office should be arranged to ensure continuity. All aspects of diversity among EB Elected Members should be considered in the selection process.

Each Elected Member should chair or be a member of a governance committee, so that no elected member should be without a special task and responsibility.

The duties of the Executive Board include administrative matters and governance issues. The EB oversees the organisational structure of the Union, and otherwise carries out the duties currently specified for the Bureau in Statute 7.4. The EB meets in-person, virtually, or a hybrid of these on a regular basis; a meeting every 2 - 3 months is suggested.

- b. Division-Standing Committee Board (DP-SCC):** This Board is responsible for the scientific direction, activities, and contributions of the Union. Division Presidents and Standing Committee Chairs are the members of this Board. The Executive Director and Secretary General are *ex-officio* non-voting members of this Committee.

The DP-SCC meets in person, virtually or hybrid on a regular basis (every 3 months is suggested) to review their project portfolios, collaborations within and outside the Union, scientific conferences in the areas of interest to the Divisions and Standing Committees, and relevant emerging areas in the chemical sciences. The Committee meets with the EB every 6 months electronically to discuss the project portfolio and cooperation/collaboration activities. The DP-SCC may make recommendations on scientific matters for consideration at Council.

- c. Council:** Membership and voting procedures of the Council are as described in the current Statutes and Bylaws. The Council meets electronically in “off years” (years in each biennium in which the General Assembly is not scheduled), and the primary biennial Council meeting is held every 2 years, preferably but not necessarily in conjunction with the General Assembly and IUPAC Congress. A face-to-face meeting is preferred for biennial Council meetings but meeting electronically or by hybrid means is also permitted. Council deals with governance matters including, but not restricted to, voting on EB and DP-SCC elections, financial plans, IUPAC structural issues, and the Statutes and Bylaws. It is recommended that provision be made at Council for discussion of one or more emerging issues that affect the Union, particularly scientific matters. Council meetings are chaired by the President of the Union and are attended by the Executive Director and members of the EB and DP-SCC.

## 2. Science

- a. Divisional and Standing Committee Structure:** The review group recommends maintaining the current overall divisional structure for the time being. However, it is recommended that the Divisions and Standing Committees form a working group to review the Division and Standing Committee structure in the light of the current state and future expectations of the field of the chemical sciences and recommend changes

## Organizational Structure Review Group Report

to the structure as needed. This activity should be completed in the 2022-2023 biennium so that changes can be implemented in time for the 2024-2025 biennium.

### Divisions

From the responses to the survey and examination of emerging areas in the chemical sciences (Section IV), the review group believes that IUPAC can best carry out its work through a combination of deep strengths in the major fields of chemistry (physical and biophysical, inorganic, organic and biomolecular, analytical and polymer, as reflected in these current Divisions), and applying these strengths to emerging issues and areas of continuing need (environment, medicine, etc.) Our recommendations and suggestions for the Divisions are based on IUPAC strategic core values, including scientific excellence, collaboration, diversity and highest standards of transparent, responsible and ethical behaviour, and on top technologies of today and the forecast for how chemistry will develop in the next decade.

It is recommended that the Divisions and Standing Committees form a working group to review the Division and Standing Committee structure in the light of current needs and emerging trends in chemistry and propose any changes to the Division and Committee structure as needed.

This work should adhere to the IUPAC Strategic Plan mission, goals and core values, and it is suggested to focus on the following areas:

- Recognise new developments and their fields of application, especially towards the principal topics in chemistry, and promote future oriented activities for the needs of the world community.
- Be committed to utilising the talents of chemists from around the world in these activities and promoting diversity in division membership. Encourage the compilation and documentation of critically evaluated data and formulate recommendations on terminology, symbols, units and conventions, disseminate the recommendations, encourage their translation as well as monitor their acceptance by the chemical community.
- Promote science and technology at the international level, including education, conferences, policy, and the assessment of societal impact. Facilitate international scientific exchange and cooperate with other international organisations.
- Also, for all divisions, digitization and sustainability should be prime concerns. IUPAC also needs to increase the contribution of chemical engineering and industrial chemistry across the divisional structure.

In the following sections, comments about emerging and possibly underrepresented areas of the chemical sciences that are relevant to each Division are made for consideration by the Division Committees. Regarding future activities, we propose that the DP-SCC may wish to discuss and act according to the following recommendations:

## Organizational Structure Review Group Report

### 1. Pure Chemistry

#### 1. Physical and Biophysical Chemistry

Physical chemistry has links to all other chemical fields, especially to catalysis, theoretical chemistry, most analytical tools, materials, interfaces, polymers, even synthesis. Biophysical chemistry overlaps with biochemistry. Cooperation with other Divisions on projects is strongly advised. Principal topics for projects include catalysis, interface chemistry, electrochemistry, photochemistry, and energy chemistry, especially artificial photosynthesis based on nanostructured and bio-inspired and photonic materials. Special consideration should be given to artificial intelligence and theoretical and computational chemistry.

#### 2. Inorganic Chemistry

Catalysis, solid state, and material science are within the focus of this Division, along with nuclear and radiochemistry. Principal topics for projects include synthesis, catalysis, materials chemistry, especially for energy storing and high-pressure chemistry. Special efforts should be on chemistry at nanoscale, including synthesis, characterisation, and functional investigations of nanomaterials.

#### 3. Organic and Biomolecular Chemistry

Principal topics are synthesis, catalysis, especially enantioselective catalysis, chemical theory and mechanism, chemical biology and organic materials chemistry, detection and measurements, environmental chemistry, industrial chemistry, and scarce element replacements. Technologies including flow chemistry, 3D-bioprinting and chemical discovery by use of artificial intelligence are developing fast and should be a focus.

#### 4. Polymer Division

Activities include synthesis, properties and uses of polymer materials, surfaces, and coatings. Principal topics are synthesis, catalysis, materials, 3D-printing, industrial chemistry, chemical engineering and environmental chemistry, especially in biopolymers and recycling of polymers. Special efforts should be on opto-electronics and membrane involved organic and polymeric materials as applied to information electronics and energy conversion and storage.

#### 5. Analytical Chemistry Division

Analytical chemistry has links into all other fields of chemistry and overlaps with physical methods, as e.g. spectroscopy at all wavelengths. Top topics are bio-imaging, biomolecule recognition, chemical detection and measurements, e.g. nano-sensors and apparatus miniaturisation.

### 2. Applied Chemistry

#### 6. Chemistry and the Environment Division

Here, we advise to reduce complexity. Top topics in view of the Global Sustainable Development Goals are clean water, clean energy, CO<sub>2</sub> sequestration, biodegradability, responsible production, climate action and clean oceans.

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### 7. Chemistry and Human Health Division

Top topics are diagnostics, green and inexpensive synthesis of pharmaceutically active molecules, including natural substance and vaccines, unravelling molecular mechanism of immune systems, development of novel tools for monitoring life processes, including biomarkers, molecular imaging techniques and single molecule spectroscopy, cheaper and faster gene sequencing tools and environmental chemistry, especially measurements.

### 8. Chemical Nomenclature and Structure Representation Division

This is clearly a principal activity of IUPAC. Digitisation and the use of artificial intelligence are key success factors for the future, because a common chemical language and nomenclature is the base for the development of new technologies.

## Standing Committees

Three new Standing Committees (Ethics, Diversity, Equity and Inclusion, and History of Chemistry and Archiving – see below) are proposed, and it is recommended that creation of these Committees be submitted for approval by the 2021 Council so that they can begin their work in the 2022-2023 biennium. Additionally, modified roles for several existing Standing Committees are recommended.

### 1. Committees with respect to governance operations

#### Committee on Ethics (Ethics) - NEW

This new committee will establish whistle-blower and harassment policies for IUPAC and prepare recommendations or guidelines for the chemistry community on publishing, sharing chemistry research, and workplace issues. The committee will ensure that all IUPAC sponsored/endorsed/organised events and activities comply with these guidelines and provide a recommendation on withdrawal of endorsement when the guidelines are not met. This committee will be chaired by an Elected Member of the EB. Members will include but not be restricted to at least one Division President or designate and one Standing Committee chair or designate. The Vice President will also serve on this committee.

#### Committee on Diversity, Equity and Inclusion (CDEI) - NEW

This new committee will establish the guidelines of the Union regarding how to promote inclusiveness within our organization and within the wider chemistry community. Such metrics of diversity may include, but are not limited to gender, age, and regional representation. The Committee will ensure that all IUPAC sponsored/endorsed/organised events and activities comply with these guidelines and provide a recommendation on withdrawal of sponsorship/endorsement when the guidelines are not met. The committee will be chaired by an Elected Member of the EB. Members will include but not be restricted to at least one Division President or designate and one Standing Committee chair or designate. The Vice President will also serve on this committee. The Executive Director or designate will be an *ex-officio* voting member of this committee.

#### Committee on History of IUPAC and Archiving (CHCA) - NEW

## Organizational Structure Review Group Report

This committee will develop policies and processes to archive, study, and share all the rich legacy of the Union and communicate the historical and ongoing role of IUPAC in the creation of the common language of chemistry, in the establishment of a set of recommendations and critically evaluated measurements, and in contributing to the chemistry enterprise. This committee will also be responsible for collecting, archiving, and making available the materials produced by the Divisions, other committees, and the governing bodies of the Union. Another goal of this committee will be the promotion of the history of chemistry as a discipline and as a key tool to understand how chemistry has evolved to where it is today. This committee will be chaired by a member of the EB. Members will include but not be restricted to at least one Division President or designate and one Standing Committee chair or designate. The Executive Director or designate will also serve on this committee as ex officio.

### Finance Committee (FC)

Responsibilities and composition follow current Composition and Terms of Reference.

### Project Committee (PC)

Composition of the Project Committee is as per the current Composition and Terms of Reference. The responsibilities of the PC include those outlined in its current Terms of Reference. Additionally, the PC should review completed projects on a regular basis to assure timeliness, effectiveness and compliance with the IUPAC Strategic Plan.

### Evaluation Committee (EvC)

Composition of the EvC is as per the current Composition and Terms of Reference. Responsibilities of the EvC include evaluating the performance of the Divisions and Standing Committees in view of the mission and strategic plan, with a special focus on constructive guidance. The EvC may choose to give advice to the Council as to whether a Division or Standing Committee should continue.

### Membership Relations Committee (MRC)

Composition of the MRC is as per the current Composition and Terms of Reference. The committee is primarily responsible for retention of current NAOs and recruitment of new NAOs.

### IUPAC-Solvay Award Committee (Solvay)

Composition of the EvC is as per the current Composition and Terms of Reference.

## **2. Committees with respect to publishing and nomenclature activities**

### Pure and Applied Chemistry Editorial Advisory Board

Responsibilities and composition follow current Composition and Terms of Reference.

### Chemistry International Editorial Board

Responsibilities and composition follow current Composition and Terms of Reference. An Elected Member of the EB is included in the membership of this Committee.

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### Committee on Publications and Cheminformatics Data Standards (CPCDS)

Responsibilities and composition follow current Composition and Terms of Reference. An Elected Member of the EB is included in the membership of this Committee.

### Interdivisional Committee on Terminology, Nomenclature and Symbols (ICTNS)

Responsibilities and composition follow current Composition and Terms of Reference. A member of the EB is included in the membership of this Committee.

## **3. Committees with specific fields of activity within the chemical sciences**

### Committee on Chemistry and Industry (COCI)

Responsibilities and composition follow current Composition and Terms of Reference. COCI should be encouraged to build greater involvement from industry, including but not restricted to large national and global commodity and specialty chemical companies, pharma, and small and medium-sized chemical businesses. COCI should be encouraged to develop affiliations with regional and global chemical industry bodies such as, for example, ICCA, CEFIC, American Chemistry Council, etc., and thus can be a lever for sponsorship income through the new Company Associates Program.

### Committee on Chemistry Education (CCE)

Responsibilities and composition follow current Composition and Terms of Reference. This committee can be the platform for webinars and other applications of social media to education and outreach activities.

### Committee on Chemical Research Applied to World Needs (CHEMRAWN)

Composition of the Committee follows current Composition and Terms of Reference. This committee should include a focus on cooperation between IUPAC and international organisations and initiatives such as UNESCO, UN SDGs, etc. to identify critical world needs and recommend involvement by the relevant Divisions and Standing Committees.

### Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD)

Responsibilities and composition follow current Composition and Terms of Reference. Each division should be active in the field. This committee is primarily tasked with encouraging interdivisional projects.

## **d. Other Governance recommendations**

1. Explore mechanisms to enable participation of new and potential NAOs from disadvantaged countries to become NAOs (by end 2022). This work would fall naturally within the scope of the Membership Relations Committee.
2. Increase engagement with non-IUPAC chemical societies, academies of science, and other similar organisations by, for example, inviting representatives to attend the GA as an observer (by end 2026).

## **3. The Secretariat and Finances**

## Organizational Structure Review Group Report

The Secretariat performs indispensable functions for IUPAC, including sound management of the finances of the Union. The following recommendations and suggestions are intended both to enhance the contributions of the Secretariat but also, over time, to decrease costs.

### a. Secretariat Location

1. Evaluate suitability of a virtual or hybrid office model (by end 2022).
2. If hybrid/in-person preferred, consider location in order to balance staff retirements, with synergies on costs and staff expertise (within 2-5 years).

### b. Secretariat staff and functions; financial matters

1. Complete skills assessments for current staff and map to the tasks that the Secretariat are currently required to take on (by end 2021).
2. Complete the work to move away from paper to electronic handling of data and materials (by end 2021).
3. Consider viability of outsourcing activities/responsibilities of the secretariat; i.e. day-to-day financial handling, communications, marketing etc. (by end of 2022).
4. Strengthen expertise at the Secretariat focused on Communications, including web, social media, and public outreach (by end 2022).
5. Strengthen expertise at the Secretariat focused on Information Technologies, including virtual meeting technologies; and branding/promotion, including the IUPAC shop (by end 2022).
6. Consider utilisation of volunteers or interns to help on administrative tasks that do not require specialist expertise; e.g. *ad hoc* group to organise archival files and similar materials, internship program (by end 2021).
7. Complete the work on establishing an Endowment Fund and a mechanism for allowing for charitable donations (ongoing).
8. Assess whether IUPAC should negotiate a fixed amount (as per prior arrangement) from conference organisers for endorsed conferences, with funds to be used to support travel/attendance of chemists from developing countries.

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### 4. Communication

The theme of improved communications was one of the most strongly emphasised among the responses to the survey. Listed here are recommendations and suggestions to address respondent's requests and concerns.

#### a. Communication of IUPAC achievements

1. Establish an IUPAC newsletter (quarterly or semi-annual basis) that is freely distributed to all stakeholders (members, NAOs, chemical societies etc), to inform them about projects, activities, initiatives, awards and news. Seek contributions from NAOs for inclusion also (by end 2021).
2. Establish an biennial report/summary document containing reports from divisions and committees, project updates, online content (e.g. Periodic Table Challenge) (by end 2021).
3. Make *Chemistry International* more widely accessible (by end 2021).

#### b. Strengthening the communicative power of the website

1. A short video introduction from the IUPAC President (plus answers to the commonly asked questions) of IUPAC may be beneficial, particularly for those people who have English as a second language (by end 2021).
2. On the contact us page, add a link to the secretariat page (by end 2021).
3. Add bullet point descriptions for primary task responsibilities (i.e. publications, finance) to the secretariat staff biographies (by end 2021).
4. Become a hub of information about current topics of interest (SDGs) or rapidly evolving situations (COVID-19).

#### c. Create a platform to facilitate the sharing of information

1. NAO Forum: This Forum is a yearly electronic meeting with representatives of each NAO and ANAO and would provide the NAOs with an opportunity to interact with leadership, asking questions etc. Reports may be made by the Executive Board and the Division-Standing Committee Board at the NAO Forum on decisions and activities of the Executive Board and Division-Standing Committee Board; the activities of the Secretariat, including budgets and expenditures; and proposals that may be made from time to time for consideration at Council. Topics may include mutual activities among the NAOs, emerging issues facing the Union, and other similar matters. Meetings of the NAO Forum are chaired by the President of

## Organizational Structure Review Group Report

IUPAC. The Executive Director is an *ex-officio* non-voting member of the NAO Forum.

2. Presidents Forum: An annual meeting (online in off-years and in-person in years with GA) with the presidents of all chemical societies. This is a strategic opportunity, as the chemical societies never meet, besides in regional meetings, as an occasion for IUPAC to exercise its convening role in global chemistry to show leadership and coordination of international initiatives. There should be a theme (e.g. international years, global activities...) with a deliverable.
3. Host webinars in collaboration with other international groups i.e. NAOs.
4. Develop a process for communication with NAOs that assures the proper person/s are receiving and acknowledging communications from IUPAC (by end 2021).

### 5. Membership

Following are recommendations and suggestions for enhancement of the experiences of IUPAC volunteers as they work on Division Committees, Standing Committees, project task groups, and similar activities. Many of these are in response to requests and observations in the responses to the survey.

- a. **Create a handbook for volunteers.** Items that could be included:
- b.
  1. Highlight responsibilities of a member (could also look at differences in roles between titular member etc).
  2. Letter from the IUPAC president welcoming the volunteer and thanking them for their service.
  3. Summarise the benefits of being an IUPAC member.
  4. Explain the project system – how to apply, decision process, joining existing project; to increase engagement and involvement.
  5. Directory of important people to contact (division chairs, elected officials).
  6. Summarize who to reach out to in the Secretariat office for specific purposes i.e. financial matters.
  7. Statutes and bylaws.
  8. Highlight processes to claim re-imbursements.

## Organizational Structure Review Group Report

- c. **Recognition of volunteers' service:** Establish a program to provide certificates (or some other mechanism) to acknowledge completion of projects, service on a Division Committee or Standing Committee or ad-hoc working group, and other volunteer service (by end 2022).
- d. **Establish a database of active volunteers within the Union.**
  - 1. Secretariat to encourage people to give IUPAC permission to share their email/name/details with a closed group of people i.e. other IUPAC volunteers actively contributing to divisions/projects to facilitate networking and cross-collaborations.
  - 2. Use this, or the current website to also capture historical information (how have people otherwise been involved with IUPAC?)
- e. **Overhaul the various individual membership options**
  - 1. Establish a task group to consider different membership categories depending on whether you come from industry/academia/student. Potentially simplifies the marketing that is required and (if students are free/significantly cheaper) may attract them to be engaged with the Union early.
  - 2. Assess whether the fees need to consider geographical location of the applicant.
  - 3. Develop a marketing campaign to promote membership options *and* benefits.

Regarding recommendations for the Secretariat, Communications, and Membership above, the review group acknowledges that there are current activities and initiatives already under way that are consistent with several of these recommendations. We hope that our recommendations will serve to reinforce these ongoing efforts and to highlight their importance to IUPAC.

## VI. Acknowledgments

The Organizational Structure Review Group acknowledges the persons and NAOs who responded to the survey, and all others who provided information, for their thoughtful and insightful comments and suggestions. The review group looks forward to discussions with the Executive Committee.

## **Organizational Structure Review Group Report**

### **VII. Appendices**

Appendices will appear in a Dropbox location for access by Executive Committee members.

APPENDIX I. Survey Questions

APPENDIX II. Survey Summary  
[Responses Submitted via Cognito Forms]

APPENDIX III. Survey Summary  
[Responses Submitted Directly from NAOs]

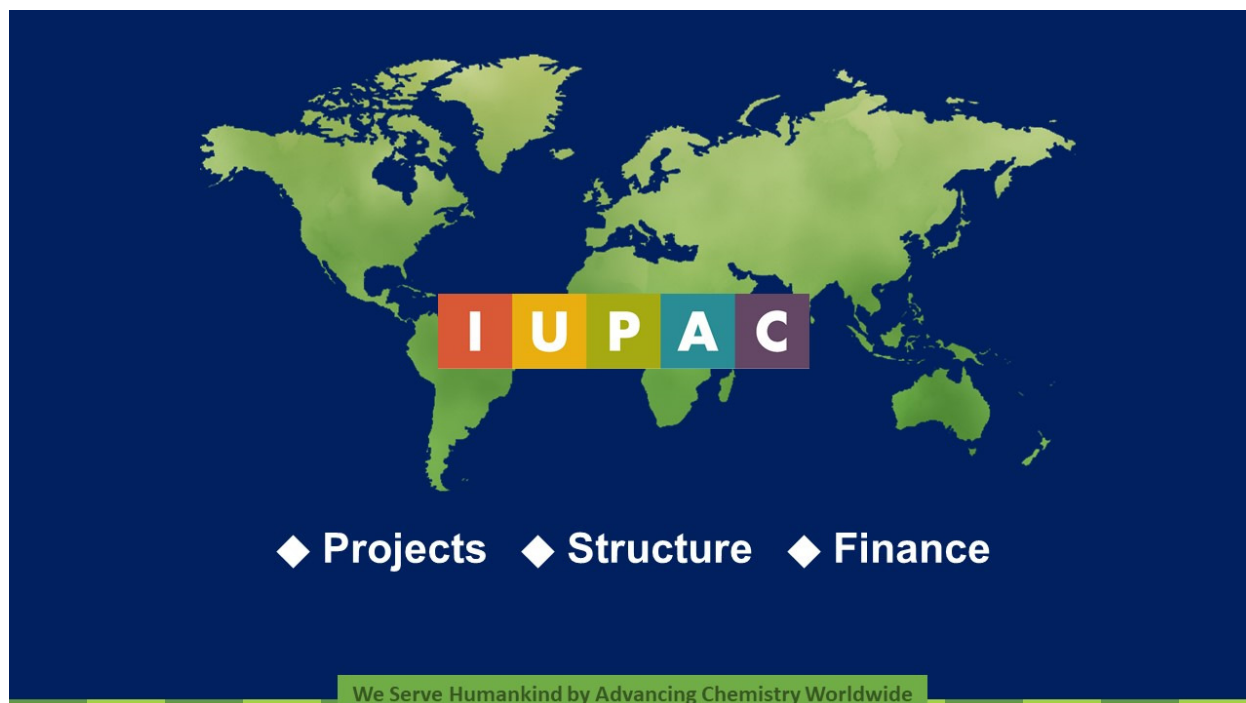
APPENDIX IV. Abstracts of Papers from Colleagues of Prof. Zhigang Shuai on Emerging Areas in the Chemical Sciences

Respectfully submitted,

Mark Cesa  
Ito Chao  
Michael Droescher  
Lori Ferrins  
Javier Garcia Martinez  
Zhigang Shuai

# IUPAC Organizational Structure Review Group

## APPENDIX I. SURVEY







**Vision**  
An indispensable worldwide resource for chemistry



**Mission**  
Provides objective scientific expertise and develops the essential tools for the application and communication of chemical knowledge for the benefit of humankind and the world.



**Values**  
Scientific excellence, communication, transparency, diversity, and ethical behavior

We Serve Humankind by Advancing Chemistry Worldwide

## Introduction

---

Since 1919, IUPAC has been creating a common language for chemistry through international collaboration. Its visionary endeavors and free exchange of scientific information have laid the foundation for the modern advancement of science and technology. Today, humankind faces pressing challenges; global sustainability and inter- and transdisciplinary collaboration have never been as important as they are now. Chemistry is a main driver of scientific progress, and it needs to respond to the needs of a changing world.

IUPAC needs the collective wisdom of all of its stakeholders to imagine whether, and how, IUPAC should evolve in order to carry out its tasks most efficiently. Your input, together with the thoughts and ideas of other stakeholders, will help guide recommendations for the timely evolution of IUPAC and enable its future contributions to the betterment of humankind.

---

Responses are required for the starred (\*) questions

Note: you can save your progress at any time and return to complete this form, simply scroll to the bottom of the form and select "Save", an email will be sent to you with a link to your partially completed responses.

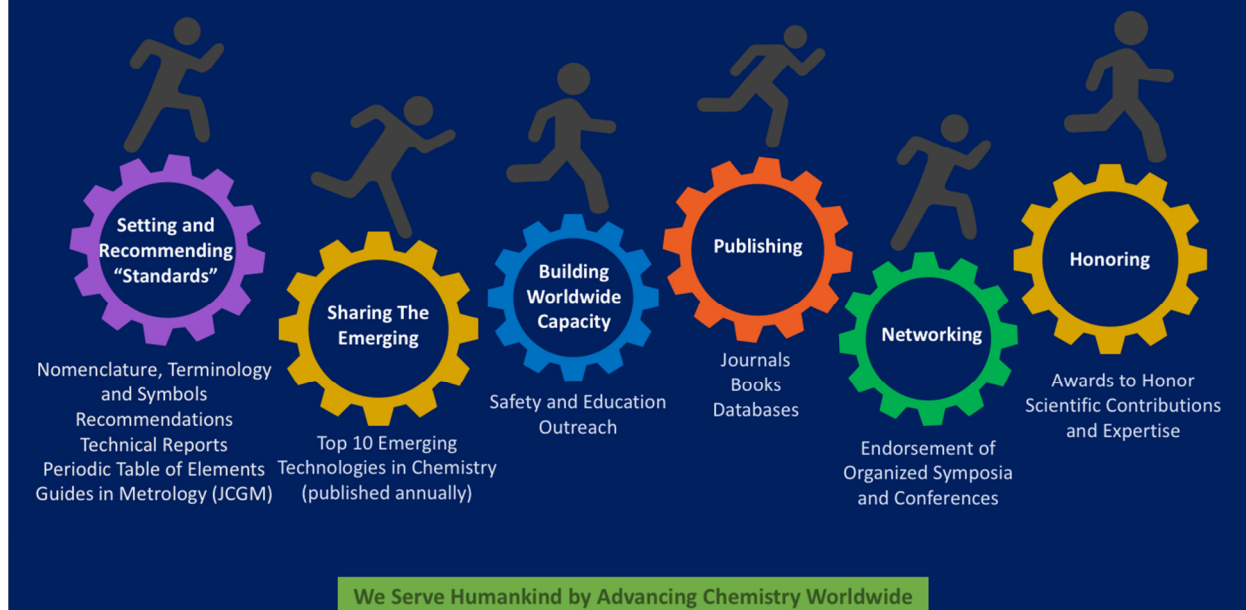
## Your Background

On behalf of which NAO are you completing this form? \_\_\_\_\_

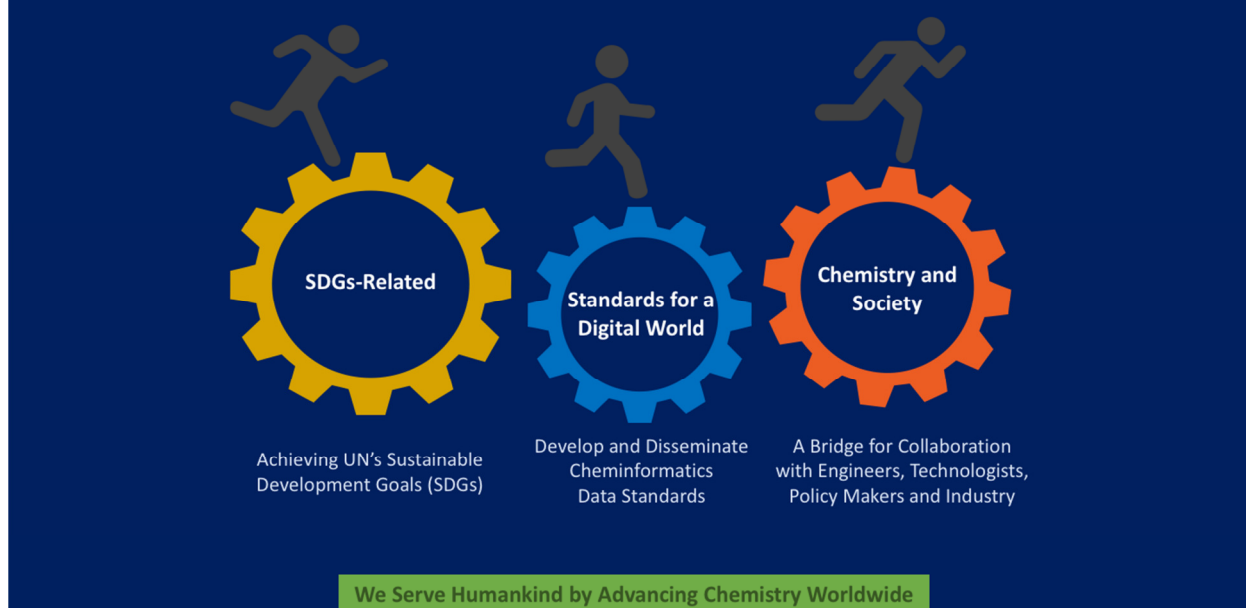
## IUPAC Scientific Activities

**Please browse through the following slides about IUPAC's scientific activities**

## Some Current IUPAC Scientific Activities



## Emerging Emphases



Want to learn more? Click on the following Links:

1. **Setting/recommending "standards":** Nomenclature; Recommendations; Technical Reports; Periodic Table of Elements; Guides in Metrology (JCGM)
2. **Highlighting the Top Ten Emerging Technologies in Chemistry**
3. **Building worldwide capacity (Safety and Education outreach)**
4. **Publishing:** Journals; Books; Databases
5. **Networking:** Conferences

6. **Honoring:** Awards

**a. Current Status**

**1. In your view what is the importance of the various activities undertaken by IUPAC?**

i) Setting/recommending standards	Very important	Quite important	Important	Somewhat important	Not important
ii) Identifying and sharing key chemical technologies	Very important	Quite important	Important	Somewhat important	Not important
iii) Capacity building worldwide	Very important	Quite important	Important	Somewhat important	Not important
iv) Publishing	Very important	Quite important	Important	Somewhat important	Not important
v) Networking	Very important	Quite important	Important	Somewhat important	Not important
vi) Honoring	Very important	Quite important	Important	Somewhat important	Not important
vii) Other	Very important	Quite important	Important	Somewhat important	Not important

**If you answered Other above, please describe** \_\_\_\_\_

**2. For each activity below, to what extent is IUPAC's work unique or distinctive with regards to other chemistry-based organisations or similar scientific organisations?**

i) Setting/recommending - Nomenclature/terminology/symbols	low	medium	high
ii) Setting/recommending - Other standards	low	medium	high
iii) Identifying and sharing key chemical technologies	low	medium	high

iv) Capacity building worldwide	low	medium	high
v) Publishing - Books	low	medium	high
vi) Publishing - Journals	low	medium	high
vii) Publishing - Databases	low	medium	high
viii) Networking	low	medium	high
ix) Honoring	low	medium	high
x) Other	low	medium	high

**If you answered Other above, please describe** \_\_\_\_\_

**Comments**

\_\_\_\_\_

**3. What benefits do you receive from IUPAC's activities?**

\_\_\_\_\_

**4. When you review the range of activities undertaken by IUPAC today, and the resources IUPAC has, do you feel that:**

- i) There are important gaps
- ii) IUPAC has it about right
- iii) IUPAC is spread too thinly and under-resources important activities

**Please explain your selection(s) above**

\_\_\_\_\_

**b. Looking to the Future**

**5. Do you feel the most valued and distinctive activities for IUPAC will significantly change in the next decade? Please explain your choice below.**

Yes

No

**5i) To what extent and in what ways?**

---

**5ii) In what areas should IUPAC be focusing in the future and why?**

---

**6a) How can IUPAC adapt to the evolving needs of the chemistry and chemical engineering community?**

---

**6b) How can IUPAC reach out to new beneficiaries? And who might they be?**

---

**6c) How might IUPAC better reach and engage with chemical organizations and societies?**

---

**7. Which areas of chemistry or chemical engineering are not currently reflected within IUPACs structure?**

---

**8. How responsive to the changing world do you find IUPAC today?**

Not responsive

Somewhat responsive

Responsive

Highly responsive

**9. Some National Adhering Organizations (NAOs) have information of global importance (e.g. information relevant to Covid-19 or climate change)**

**i) Do you think IUPAC should be a hub for sharing information from global chemical societies?**

Yes

No

**ii) If you represent an NAO, will your NAO or national chemical society be willing to notify IUPAC and let it broadcast your webpage or social media content?**

Yes

No

**If you answered Yes above, what is your NAO?**

---

**10. IUPAC wants to strengthen its links into chemical industry**

**i) How beneficial is to industry working with IUPAC?**

Very beneficial

Somewhat beneficial

Neutral

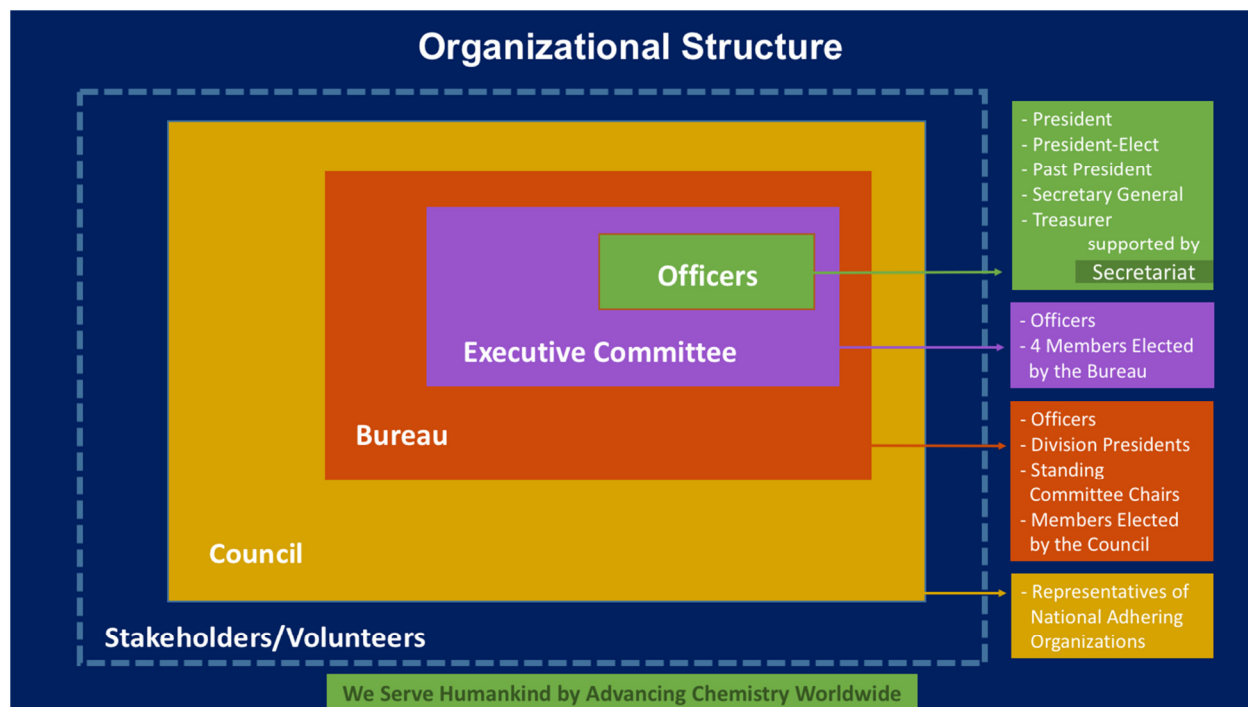
Not beneficial

**ii) What should IUPAC do to improve its links to industry?**

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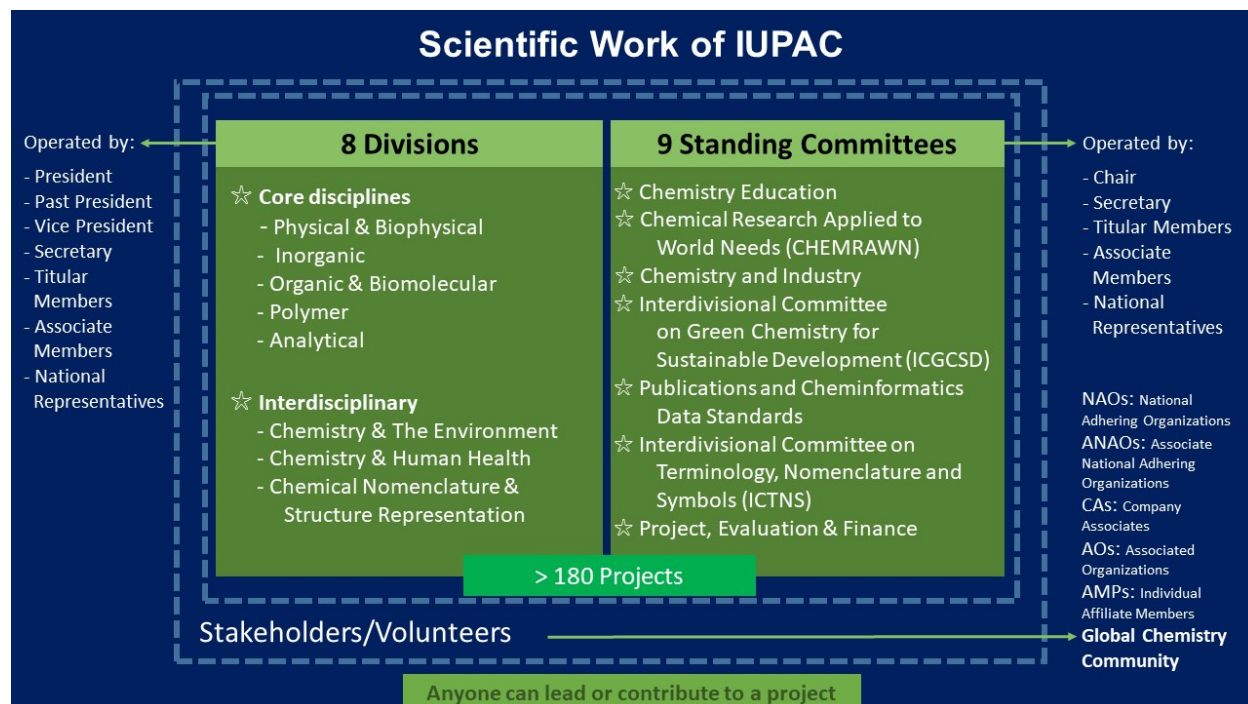
## **IUPAC Structure and Finance**

**Please browse through the following slides about IUPAC's Structure and Finance**

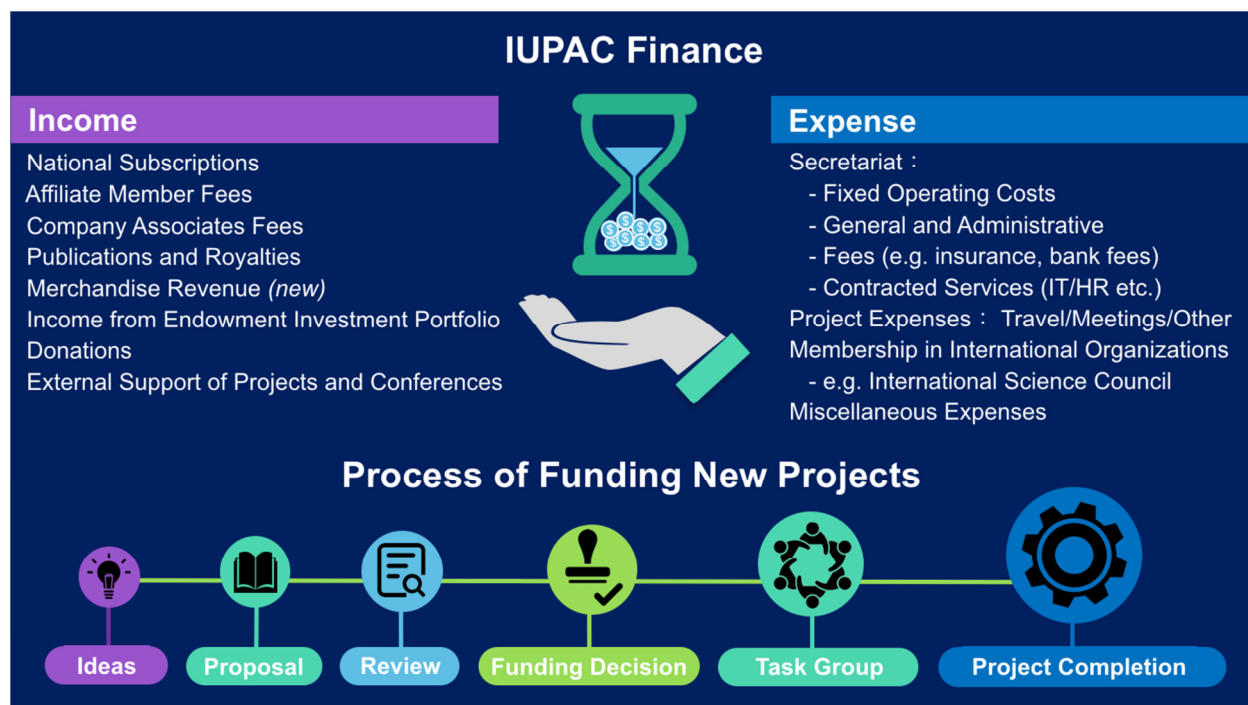


1. **Current global members: More than 50 National Adhering Organizations (NAOs)**
2. **Want to learn more? Click on the following links.**
3. **Officers ; Executive Committee ; Bureau ; Council ;**
4. **Secretariat: Executive Director plus 4 staff members**

**Stakeholders:** National Adhering Organizations (NAO), Associate National Adhering Organizations (ANAO); Company Associates (CA); Associated Organizations (AO); Affiliated Members(individual members (AMP)



Want to learn more? Click on the following links [Divisions](#), [Standing Committees](#)



Want to learn more? Click on the link [Projects](#)

11. In what ways could IUPAC serve its current members and volunteers better and more effectively?

**Associated/National Adhering Organizations:**

---

**Company Associates:**

---

**Associated Organizations:**

---

**Affiliate Members:**

---

**Volunteers:**

---

**Other:**

---

**12. What is your opinion of the structure of IUPAC?**

- i) The current organization provides the foundation for us to adapt for the future
- ii) The current organization is overly complex and won't be able to adapt quickly
- iii) The current organization does not cover certain important topics:

**If you answered the organization does not cover certain important topics, please list here**

---

**13. Does IUPAC need to change its organizational structure?**

Yes

No

If you answered yes above:

**i) What changes would you recommend?**

---

**ii) What do you feel are the principal organizational features that are needed for IUPAC to be more effective in the future?**

---

**iii) Are there other organizational or operational models of which you are aware that would be more effective or intrinsically less costly?**

---

**iv) In what ways could IUPAC simplify the administrative tasks and processes undertaken today?**

---

**14. What steps would you suggest for IUPAC to secure its financial sustainability?**

**i) How can IUPAC increase revenue?**

---

**ii) How can IUPAC lower its operating costs?**

---

**15. Could IUPAC benefit from using online platforms to solicit funds and ideas from the chemistry community?**

Yes

No

**Comments**

---

**Final comments if topics of your concern are not included above**

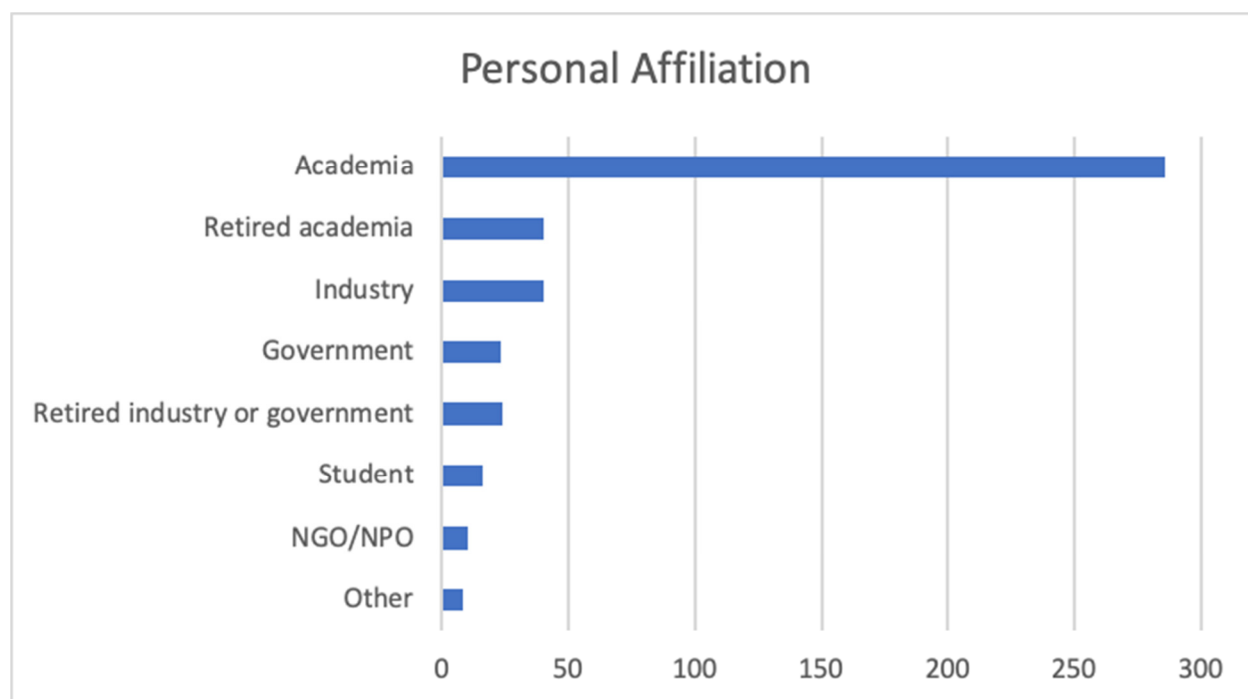
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# IUPAC Organizational Structure Review Group

## APPENDIX II. Survey Summary [Responses Submitted via Cognito Forms]

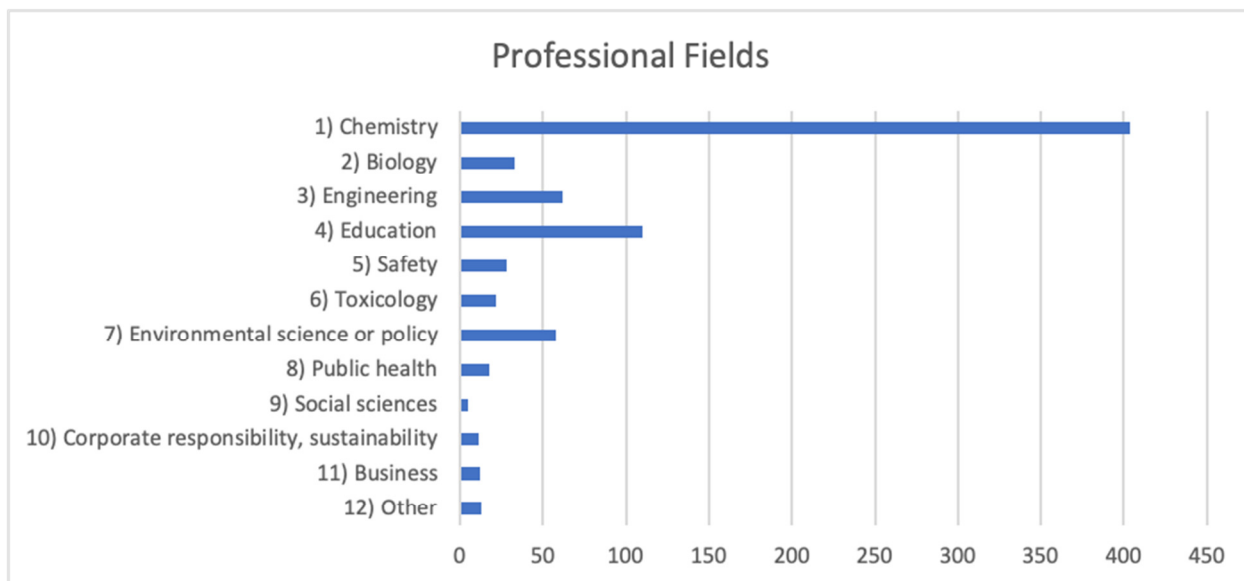
### Background information of the respondents

#### Professional Affiliation \*



**If you answered Other above, please describe:** Autonomous utility, public water and wastewater utility, junior chemist looking for a job, organisation for prohibition of chemical weapons (international convention implementation), consultant statistics & chemistry, teacher at school, technical consultant undergoing teacher training,

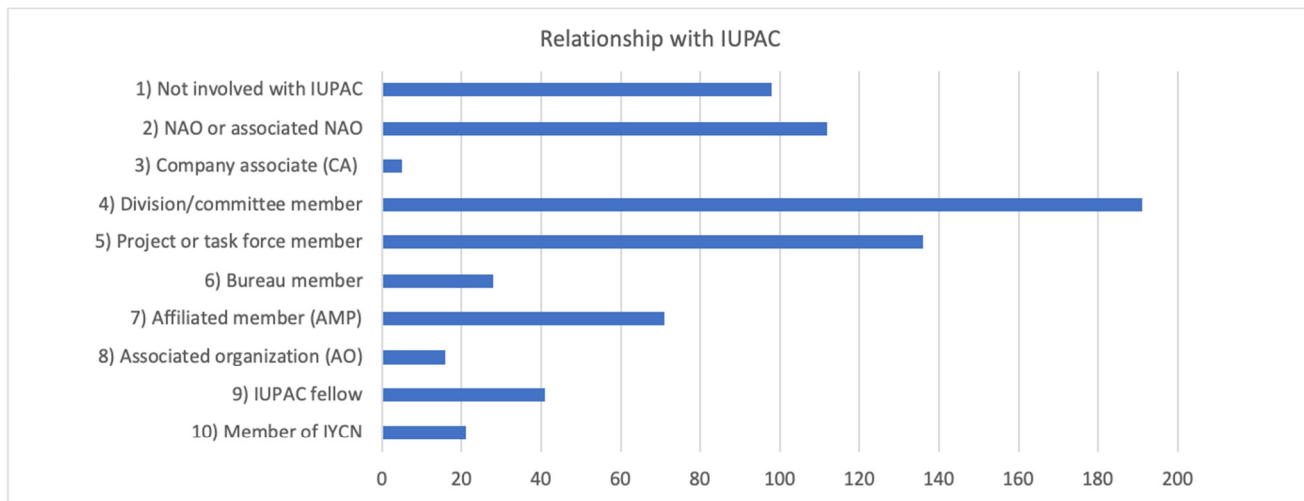
**Your Professional Field(s) (Check all that apply) \***



**Full description of the choices:** 1) Chemistry ( organic, inorganic, analytical, physical, environmental, biochemistry, medicinal...), 2) Biology (molecular, synthetic, genetics...), 3) Engineering (chemical, mechanical, electrical, environmental, industrial...), 4) Education (chemical education research...), 5) Safety, occupational health, industrial hygiene, 6) Toxicology, 7) Environmental science, environmental health science, or environmental policy, 8) Public health, 9) Social sciences, 10) Product stewardship, corporate responsibility, sustainability, 11) Business (sales, marketing, communications), 12) Other

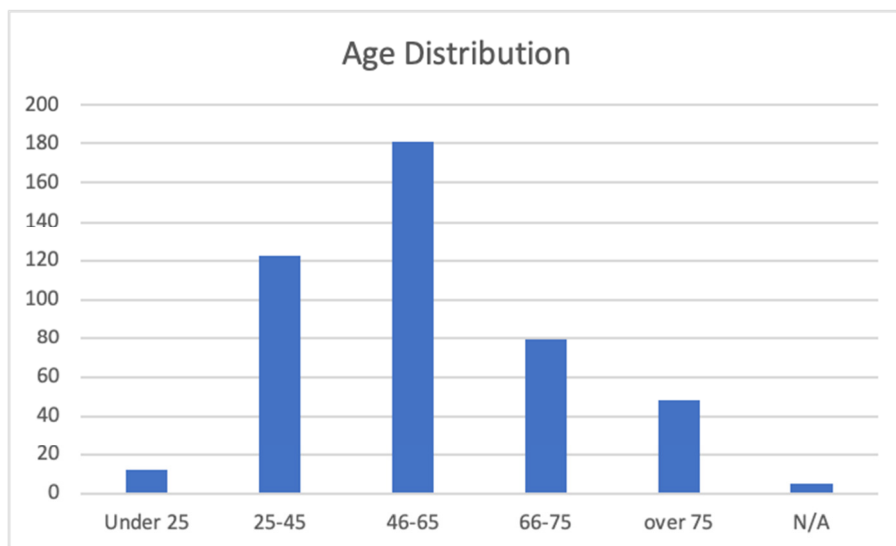
**If you answered Other above, please describe:** Chemical information, knowledge and information management, legal, materials science, maths, medicinal, pharma, physics, polymer science

**If you are affiliated with IUPAC, or have been involved previously, what is/was your role? (Check all that apply) \***

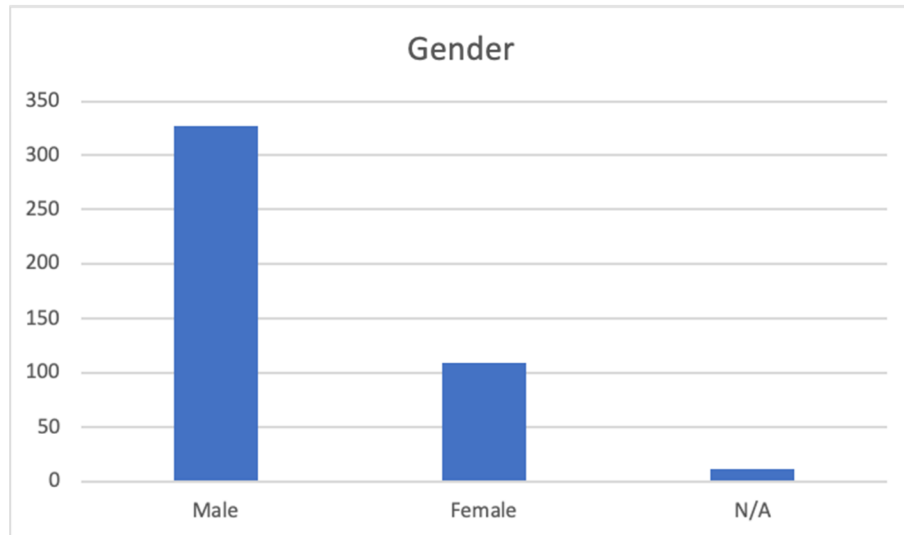


**Full description of the choices:** 1) I have not been involved with IUPAC previously, 2) Representative of a national adhering organization (NAO or associated NAO), 3) Representative of a company associate (CA), 4) Division/committee member, 5) Project or task force member, 6) Bureau member, 7) Affiliated member (AMP), 8) Associated organization (AO), 9) IUPAC fellow, 10) Member of the International Younger Chemists Network IYCN

## Your Age



## Your Gender



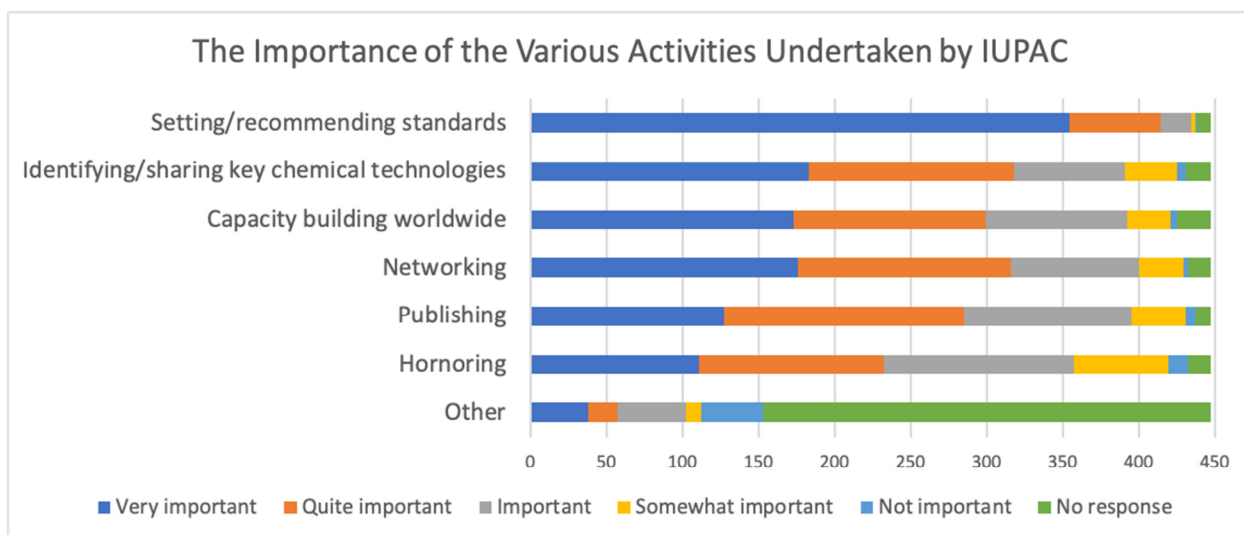
## Country/Region where you reside\*

### Respondents are from 61 country/region:

Albania, Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Canada, China/Beijing, China/Taipei, Costa Rica, Croatia, Cuba, Czech Republic, Denmark, Ecuador, Egypt, Finland, France, Georgia, Germany, Ghana, Greece, Hungary, India, Ireland, Israel, Italy, Jamaica, Japan, Kazakhstan, Kenya, Malaysia, Mexico, Morocco, Nepal, Netherlands, New Zealand, Nigeria, Norway, Poland, Portugal, Puerto Rico, Qatar, Russia, Saudi Arabia, Senegal, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States, Uruguay

## Survey results

### 1. In your view what is the importance of the various activities undertaken by IUPAC?



There is a good consensus that setting and recommending standards is the most important activity of IUPAC.

Some respondents pointed out that the important activities should include the following:

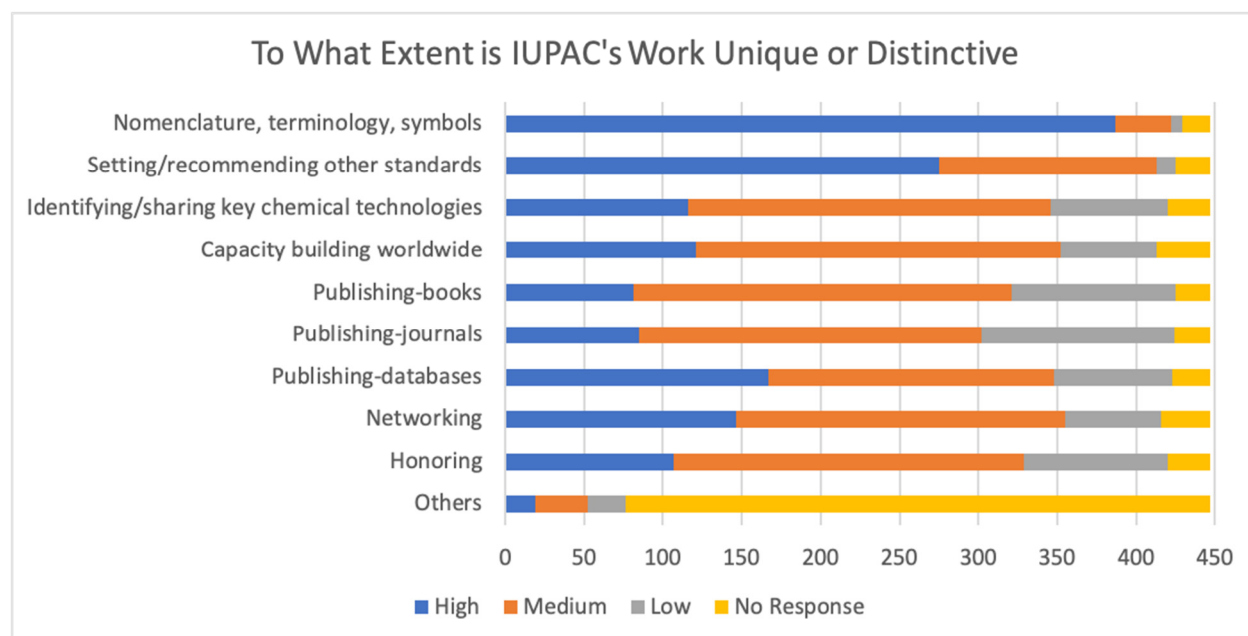
- Supporting and engaging individuals and NAOs (14):
  - o At the individual level—mentoring and empowering younger chemists; scholarship; training; career development; helping scientists in disadvantaged countries.
  - o At the NAO level—facilitating the exchange activity experiences among countries
- Enabling communication and networking (8): communicate with other fields; be a member of international organizations; sponsoring conferences
- Being politically active and objective (7) and leading and representing the global chemistry community (5): science policy; SDGs; climate; diseases; supporting the access to science movement; leading into the digital age; building bridge between chemistry and society
- Being a reliable source of information and updates (6): identifying top technologies; Technology forecasting; cover diverse chemistry-related topics (such as stamp, coins, paper notes, collectables)

- Facilitating collaborations (5): among societies and bodies; interfacing with industry; Supporting and funding trans-disciplinary cooperation project among countries of the North and South hemispheres
- Improving chemistry literacy and education (4)
- Promoting social equity and diversity in the chemistry community (3)

There are two reminders:

- Be responsive (1): adjusting vision when environment/culture is changing
- Be focus(1): do not do too much

**2. For each activity below, to what extent is IUPAC's work unique or distinctive with regards to other chemistry-based organisations or similar scientific organisations?**



There is a good consensus that setting and recommending standards (including nomenclature) is the most unique activity of IUPAC.

### **If you answered Other above, please describe**

A few respondents filled in “other”. It is not clear whether these are suggestions or deemed as distinctive activities of IUPAC.

- Active member participation from low-income countries in Division/Committee activities
- Bridging the innovation gap between academia and the chemical industry
- Cooperation with other international NGOs such as UN, IUPAP, etc..
- Digital technologies
- Disseminate the Mission of Chemistry at global level with Statements to create an "Umbrella role" for worldwide needs
- Fostering IUPAC's goals for the 2030 initiative across diverse nations through capacity building in chemistry applications to world needs and also across generations of chemists.
- Mentoring
- Outreach
- Promote gender diversity
- Promoting interdisciplinary cooperation programs and projects
- Providing educational guidelines
- Science Policy

### **Comments**

For the “comments”, the contents can be categorized as following:

About the uniqueness of IUPAC, it has been pointed out by respondents:

- Standards and databases availability for all countries and regions
- Inclusive networking by taking into account evident disparities among countries
- Outreach and capacity building for those countries and regions in disadvantage
- Honoring relevant personalities not only for the front-line discoveries, but also for their role to extend chemistry and human development
- Volunteers making great contributions not often seen in other organizations
- IUPAC’s associated organization IYCN is doing commendable efforts such as mentoring

A lot of suggestions have been provided.

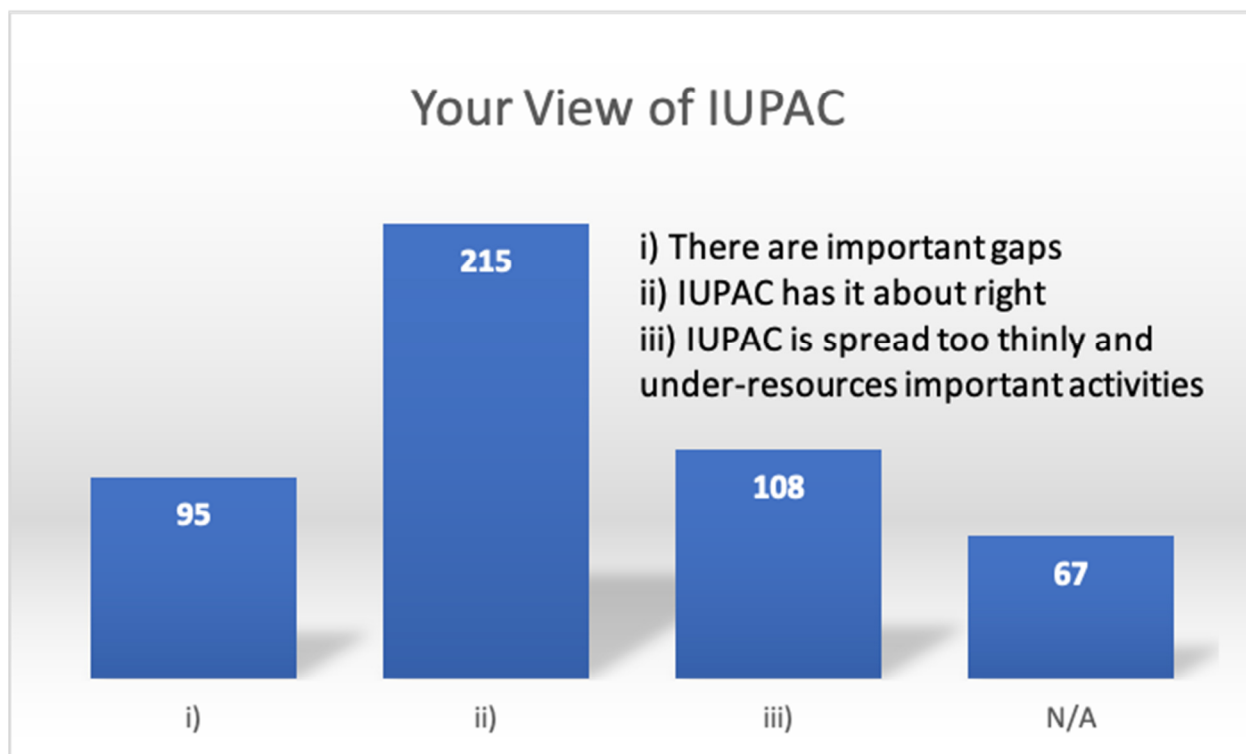
- Regarding setting standards:
  - Be aware of the trends of multi-nations/multi-organizations efforts on nomenclature/standards; IUPAC and ISO may have similar tasks

- Other disciplines may need chemistry standards; IUPAC should publish in more broad/transdisciplinary fields
- Regular review of standards, nomenclature and terminology; publish on internet should be enough
- Regarding projects:
  - Activity to sustain the mission for sustainability; promote sustainable chemistry
  - Embrace digital technologies soon; need more IT tools
  - Make activities more visible, involve NAOs and have more activities on the national level
  - New ways of focusing education and system
  - Avoid “me too” projects
  - Provide continued project funding
- Regarding involving more people:
  - Should make IUPAC more visible and well known even in the chemical communities
  - More tools that can be used by NAOs in outreach activities should be developed and made available; facilitate networking between NAOs so that material used in one country can be made available in other countries; more use of the chemical communities in the member countries
  - Need recruitment of chemists; in touch with the young generation; make better contact with individual member; direct survey question to leading people in chemical industry and in academic institutions for chemistry and chemical engineering;
  - Activate much further communication lines with NAO'S, ANAO'S and Associate Organizations
  - Set up a small committee dealing with cooperation with other international NGO'S

### **3. What benefits do you receive from IUPAC's activities?**

There are 230 respondents who replied to this question. 34% of the respondents feel that IUPAC has provided a platform to create connection between chemists; 30% feel that they have benefited from IUPAC's standards, nomenclature and terminology; 33% receive benefits from all kind of knowledge obtained by attending conferences or reading publications ; 6% receive fulfillment and recognition; 7% miscellaneous (equal participation, safety, funding ); 7% feel they have yet to receive any benefits. (Note: Respondents may express benefits from more than one aspect, therefore, the sum of the above numbers exceeds 100%.)

**4. When you review the range of activities undertaken by IUPAC today, and the resources IUPAC has, do you feel that:**



Note: There are 8% of respondents that chose more than one answer in the above analysis.

### **Please explain your selection(s) above**

The replies by 182 respondents are diverse and are summarized below. Most respondents are aware of the financial constraints of IUPAC. Otherwise, most replies are unique.

#### **IUPAC has it about right**

Attitude and operation:

- IUPAC is devoted to equal and open distribution of information between all countries.
- IUPAC is working fine and has a good administration, very decentralized and democratic.
- Conferences and support for chemists/scientists from less developed countries are very valuable

Activities under the current financial constraint:

- IUPAC is active in all the areas of chemistry and activities are consistent with the mission. IUPAC makes a tremendous contribution to chemistry and science worldwide. A variety of ongoing activities have significant impacts; certain overlap with activities of other bodies, much of it could be overcome by deeper collaboration with other international organizations in the fields of chemistry or physics or crystallography; now, the trends of transdisciplinary and digitization become more and more important to the global researcher. Given the need for resources and finances on a global scale, IUPAC has managed to maintain a recognised position.
- The range is about right but all activities can suffer from temporary under-resourcing as priorities change. It may not be easy to do much more with the current resources. Removing some of the activities would generate corresponding losses. Deciding that activities in certain fields are more important than others, and providing resources on this basis, may not respond to objective criteria. Since IUPAC comprises all the branches of chemistry, it needs to offer the possibility of activities in all the branches.
- IUPAC has managed to launch an important digital data initiative, perhaps at a cost to other endeavors. Maybe, in longer than biennial strategic plans, emphasis could shift, so as to be able to start specific initiatives and fund them more intensively so as to get them underway, without underfunding other tasks for a long period of time.

#### Human resources:

- There will always be limitations on what can be done with a lot of volunteers and very little professional staff, but that is IUPAC! From what I read in CI, overall projects seem to capture important activities, along with a few of very limited interest. From the time we started the "project system", as it has become known, I have been concerned about areas that IUPAC might be missing.
- IUPAC needs to involve more younger people in problems concerning the relevance of chemistry to the chemical community and to the world in general.

#### **Important gaps**

##### IUPAC and society:

- More work from IUPAC about the sustainable development goals (SDGs)
- There should be a clear focus on health, environmental and society related goals.
- Some people regard most chemicals as dangerous without realising that we are all made up of chemicals
- promoting and advocating for diversity, equity and inclusion in chemistry/science.
- There are plenty of scientific "fake news" on fields of chemistry and molecular sciences, spread through the social media, and we need a strategic plan to eliminate them as soon as possible, this would give IUPAC the opportunity to become more extrovert.

#### IUPAC and its members:

- Improve the relationship with the NAOs. They should be better served and receive material that can be used to promote chemistry and IUPAC in the member countries. A bottom-up approach is needed to achieve this; The national chemical societies should support IUPAC more strongly, by either supporting with human resources or funding.
- New members must be treated much more accommodating. New member countries should be invited to nominate NR to all Divisions and CCE, COCI and CHEMRAWN. That will be a boost for the national chemical community and make IUPAC activities well known.
- Mentoring young chemists; There should be more involvement of younger chemists in the activities and Divisions of IUPAC - such involvement will launch the seeds for a sustainable implementation of ideas, projects, and activities and make the voice of younger chemists (the next leaders) heard at a global level. In my opinion, this is a key action that IUPAC has to undertake to get every year more young chemists interested in the diverse range of activities promoted by the Union. One possibility could be to include younger chemists from the different countries worldwide as representatives of NAO, together with more senior chemists; There is currently no youth wing of IUPAC. I think IYCN fits in very nicely. If you look at other chemistry associations, there is always a youth chapter. IUPAC could tap onto the IYCN network and formalise this framework.
- Membership costs money and it is not clear (other than a sense of greater good) what individuals gain from the membership; Would like more online zoom meetings. would like to view talks in other languages and countries; Although I am involved in two projects I am no longer receiving Chemistry International (received some years, time ago...). No financial help to meet other members of the task forces. I have no funding for that.
- Many of the academic and industrial thought leaders do not join or contribute to any of the activities. It is not enough for a few Professors to give plenary lectures at IUPAC conferences. Take a look at the organizations such as RAPS, SOCMA, Chemistry Council and others. Industry Leaders are significant contributors to these. I am particularly disappointed at the projects being run in several divisions. They are not cutting edge and are quite low impact. IUPAC has no real mechanism to promulgate its wisdom and experience
- There has been less focus on developing countries while implementing its activities; some activities are too focused on North America and Europe. more funding should be allocated to projects for young scientists, especially in developing countries
- Fading number of participants at IUPAC subcommittee meeting.

#### IUPAC's role, vision and activities/projects:

- IUPAC has to move with the times and it has done so in many remarkable ways but it is under resourced as the primary chemistry international authority and has not been able to achieve, maintain and extend the global interaction between the main International bodies and both chemistry in academia and industry and ensure they pull together; IUPAC should be THE partner for other international organisations and be more represented in respective committees/activities which seems to be unfortunately not possible with the current number of permanent staff and volunteers in leadership positions.
- A gap analysis of the union activities should be undertaken in addition to analysis of how the current budget is utilized. This needs to feed into the development of a new mission statement and core values. Subsequently, these statements must drive the focus of the union in its funding priorities. However, the union must be agile and re-evaluate the mission and values regularly in order to adapt to changes in the discipline.
- Caution: Once projects are dependent on people's volunteer work, it is only possible to develop the work in the field of expertise of volunteers; Too many projects rely on a large group volunteers who do not respond always in a timely fashion; The pressures on individuals is such that the work of IUPAC committee needs to be delegated more and to promote broader appeal.
- IUPAC should focus much more intensively on networking and collaborations; Support to trans-national and inter-disciplinary scientific collaborations
- Database preparation and evaluation is a very time-consuming process and it is very difficult to cover all systems (compounds) being experimentally investigated. More people should be involved in the compilation processes but such activities are voluntary and only a limited amount of chemists are interested to do it.
- I would suggest the inclusion of free online digital educational resources to support chemistry teaching and learning activities. Today's students will be the future IUPAC members.
- No consistency in appearance or utility of databases; A database of Ionic Liquid properties, prepared under a recent IUPAC project, is not listed
- Has not addressing critical problems as defined by current practitioners/users/scientists/government agencies
- Financial issues:
- The available resources are insufficient to accomplish the assigned tasks; many activities cannot be financed for lack of funds.
- More financial should be necessary but this should be achieved without charging more to the NAOs. Probably financial support from the industry should be improved.
- Flexibility to meet emerging areas with new financial resources would be more important in the coming years.

#### Promotion of IUPAC:

- IUPAC fulfills very important goals, however its role might not be well understood even within the scientific community; we hear very little about IUPAC activities that may impact our work; There is a need to broadcast these results to a larger audience. There is also a need to provide the information to a greater number of scientific publications, especially those that present results to the general readership. A greater collaboration with other relevant scientific organizations would be useful.
- IUPAC is virtually unknown by young students and researchers, in practice only known because of the nomenclature rules; Few students and scientists acknowledge that scientists volunteer to work hard on deciding and setting standards for chemistry. This might be part of the reason why IUPAC is financed less than it could be.
- IUPAC should take more advantage of the IUPAC approval/label. Even "official" IUPAC periodic table and periodic table products (to bring in further income).
- IUPAC does not do enough to advertise and encourage the use of its standards.
- The IUPAC Congress and Conferences should also be held in developing countries sometimes so that the role of IUPAC in networking and information flow can increase.

#### IUPAC Awards:

- Awards and recognitions do not seem to equally represent analytical and physical chemistry, leaning too heavily toward synthetic realms.

#### Other:

- We need to think differently now after COVID 19 experience.

#### **Spread too thinly and under-resources important activities:**

##### General issues:

- The IUPAC budget is by far not in adequacy with goals and relevant needs. IUPAC is understaffed and under-resourced to have the global impact it aspires to. It is important to focus on the areas in which others are not active and in which IUPAC is a world authority. Being true to the core mission. IUPAC probably tries to do too much across too many different areas. If it continues with all current activities, IUPAC needs MAJOR influx in money and volunteer time.
- By its nature it is always going to be an organization that can undertake long-term and long-lasting work that has a slow rate of change. It is not able to effectively deal with issues that have a rapid rate of change or where currency is the dominant factor. Concentrating on what it can uniquely do would need a concentration of resources in those areas; IUPAC should define every year only one or two goals where global leadership

can be achieved, and stop wasting money on projects that do not improve the leadership position of the organization.

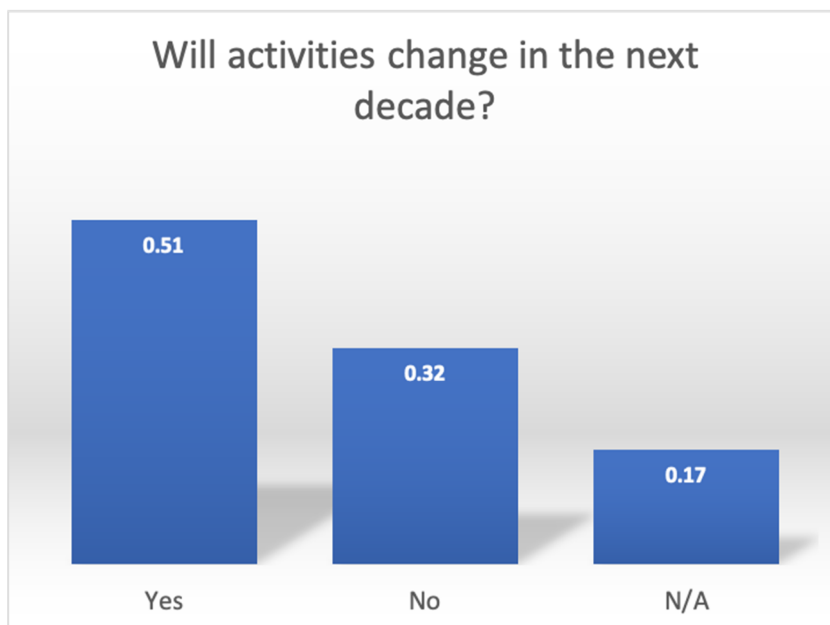
- As is typical for volunteer-organisations, IUPAC has trouble abandoning old activities in favor of new ones
- IUPAC is duplicative of many other organizations (ASTM, ISO, etc) but does not have the same reputation for high quality standards. The nomenclature is probably the area IUPAC is most clearly known for in the US, but otherwise, it does not have much of an impact.
- A lot of committees, divisions and sub-groups and not all of these are completely aligned with activities that are unique to the organization; Divisions moved away too much from Academia; committees have no or very limited technical support, so members have to do their own devilling for data/information on which to make judgements.
- Projects are delayed or not getting up
- The project system, which was introduced 20 years ago, has clearly improved IUPAC's operations but lacks the ability to focus on important themes across divisions and committees. This has resulted in a diverse portfolio of projects and diffuse impact. Rapid turnover of division presidents and other leadership positions also contributes to shifting priorities. The project system should be carefully evaluated - funding is spread over too many small projects, a nightmare to administer or review. The project driven system has no real filter for important tasks.
- Funding allocation for workshops and conferences are limited.
- To move with pace in the digital age we need people with time to commit. IUPAC relies too much on volunteer effort which is becoming increasingly stretched. IUPAC should look to fund scientists and project coordinators who can devote time to advancing IUPAC aims. These could be people based at a host institution who spend some of their time on IUPAC projects or people employed directly by IUPAC
- The importance to spread the chemical knowledge and advances all across the worlds, without exclusions originated in resource availability or political confrontations among countries, is very weakly faced by IUPAC, nowadays.
- The impact of IUPAC is not fully obvious in the Sub Saharan African countries because it is thinly spread in the continent. IUPAC will be more visible if there are Regional Sub- Units to oversee each continent. The Regional Unit will then report directly to the central coordinating body, this will ensure the incorporation of more associate member organizations.
- In the current situation at the universities, the project budgets are far too low. Therefore it is not attractive to start projects. They should be adapted to a master thesis (student payment and budget for consumables, small investments, and travel costs). A typical project with 3 partners should be at least 30000 Euro minimum to be attractive.

- Most projects do not need funds to bring people together. COVID has shown us that we can do many discussions quite productively online for small groups/collaborations. The reward of a project should be the IUPAC approval on the completed project/reports/presentations on the projects (perhaps with a pre-approval by respective IUPAC divisions before given).
- I would give up on in person conferences other than specialist meetings. I would advocate for all national governments to appoint/elect at least 1 person to work with IUPAC on implementing/maintaining/creating worldwide chemistry and related standards

Specific issues:

- Standards (nomenclature and data reporting) are very important and IUPAC must be the international leader. This work is underfunded.
- There are excellent journals published elsewhere. IUPAC should not compete with that, but should complement where necessary.
- The polymer division is energetic and productive, as are CCE and CPCDS, however other parts of IUPAC seem to anticipate funding, but produce little of value to the organisation.
- No common utility of the databases
- There should be a lot more dissemination of IUPAC projects (especially when it comes to topics that affect our everyday life, i.e. environment). This would not only inform our - chemistry and related scientific community on e.g. the developments on certain fields, but also seek investments and use of national / international / private funding for further research.
- Evolution of certain IUPAC key products, such as the Color Books, occurs too slowly; bluebook was delayed; Frequency of CI publication is reduced and difficult to obtain the IC contents via Website of IUPAC; Not sufficient resources or will to effectively migrate Chemistry International to a timely and digital future to better meet the needs of international chemists.
- My area is Drug Metabolism and Drug Safety and therein the impact of IUPAC is relatively thin.
- IUPAC has neglected to address issues in fields such as biophysics

**5. Do you feel the most valued and distinctive activities for IUPAC will significantly change in the next decade? Please explain your choice below.**



When “no” was the answer, the comment was IUPAC should strengthen the existing activities and focus on standards setting and recommendations.

### **5i) To what extent and in what ways?**

When “yes” was the answer there was a diverse number of comments (number of mentioning in brackets):

For the question “To what extent and in what ways” (AY) the main topics were

- Improve digital activities, as a better online platform, online voting, use of artificial intelligence, make color books digitally available, open publishing (25)
- Focus more on sustainability problems, SDG, and world needs (9)
- React faster on emerging issues like Covid-19 (8)
- More interdisciplinary and contact to other societies (6)
- Focus more on emerging and changing technologies (5)
- Improve networking, more diversity (5)
- More green chemistry (4)
- Open up to other regions and countries, go more international (4)
- Help educators to develop their capacity (3)

- Others want more interface between science and technological fields, see IUPAC to academic, want more applied chemistry (3)
- Speed of communication (CI, recommendations) should improve (2)

### **5ii) In what areas should IUPAC be focusing in the future and why?**

The main topics were

- SDG, climate change (27)
- Digital data standards, AI, lectures online, computational chemistry, online education, deep learning, open data, virtual laboratories (20)
- Education, world wide capacity building (17)
- Green and environmental chemistry (13)
- More applied chemistry, professional diversity, industrial chemists and chemical engineers, entrepreneurship, bridge academia to industry (11)
- Knowledge networking worldwide, international cooperation (10)
- More focus on young chemists, diversity (6)
- Interdisciplinary with physics, biology, material chemistry (5)
- Others name risk assessment, outreach to the society, ethics, alternative medicine, drug safety (each 2)

### **6a) How can IUPAC adapt to the evolving needs of the chemistry and chemical engineering community?**

The main topics here were:

- Adapt to the evolving needs, follow development in science and industry, fulfill the needs (17)
- Use more digital tools, online streaming, AI tools (16)
- Improve the public outreach of IUPAC, more visibility, more communication to industry and the public (14)
- Listen to the young generation, involve more young people, employ more diversity, support early careers (12)
- Recruit more active chemists and engineers from science and industry (9)
- Strengthen the networking with politics and industry (8)
- Interact more closely with NAOs (6)
- Inclusion of other sciences and technologies, bring in these expert (6)
- Set up a high level panel with Nobel laureates and eminent prize winners (5)

- Speed up activities, more flexibility (4)
- Set up more small meetings, conferences and seminars (3)
- Other topics were: support open access, intensify conferences and seminars, green chemistry and sustainability (each 2)

### **6b) How can IUPAC reach out to new beneficiaries? And who might they be?**

159 participants answered, from which 9 had no suggestions. The main topics of the answers were:

- Use more social, digital media and open access, increase global presence and outreach (28)
- Increase the number of young people in task groups, more young observers, reach out to and recruit more students (26)
- Promote new educational technologies, links to schools, reach out to high school students (15)
- Use the bottom up approach with NAOs to link to universities and non IUPAC members (11)
- Engage members more, intensify fellows program and individual membership, build a database of IUPAC experts (10)
- Invite non IUPAC chemical societies to become members, also other organizations near to chemistry, chemicals using industry (9)
- Conduct multidisciplinary conferences, attract users of chemistry as physicists and biologists (9)
- Intensify the promotion of IUPAC to industry, governmental bodies (8)
- Support universities and organizations in developing countries (6)
- Provide the community with high quality resources and build capacities (4)
- Start more meaningful projects (3)
- Others asked for more meetings of female scientists, strengthening of networks (2)

### **6c) How might IUPAC better reach and engage with chemical organizations and societies?**

162 answers were received, of which 13 had either no clue or nothing to add. The main topics of the remaining answers were:

- Invest more time, more activities, reach out to industry and government, organize more conferences (32)
- Connect to other organizations, involve their leaders, organize joint activities (26)

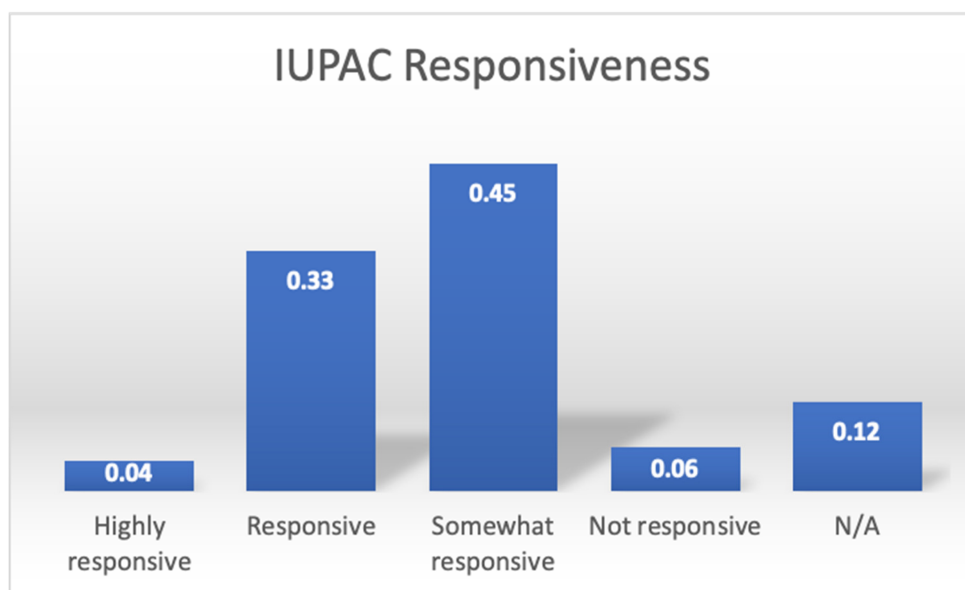
- Social media, digital platforms, videoconferences and a modernized homepage should be used to intensify visibility and information sharing (20)
- The link to NAOs is an important topic, from the question how some NAOs can pay their dues, perhaps in a block, if offices should be placed in NAOs headquarters, how the information flow could be increased both ways (19)
- Make use of the geographical hierarchy, pay attention to national activities (5)
- It is suggested to define ambassadors and engage more individual members (4)
- Do more consulting and advertise competencies, improve public outreach (4)
- Others suggest to start up with young students, increase networks (2)

## **7. Which areas of chemistry or chemical engineering are not currently reflected within IUPACs structure?**

130 answers were obtained, from which 52 participants were either not informed enough to propose areas, had no idea, or were content with the situation as it is today. The main input from the remaining answers was as follows:

- More AI, digital chemistry, chemistry 4.0 (12)
- Materials science and technology, advanced materials (12)
- Chemical engineering, chemical processes (11)
- Environmental and energy chemistry, climate change, circular economy (9)
- Pharmaceuticals and cosmetics, drug development and metabolism, Covid-19 (9)
- Biochemistry, molecular chemistry, biological engineering (8)
- Nanotechnology (5)
- Intensify interdisciplinary and hybrid areas, convergence of science and technology (5)
- Food chemistry and agro chemistry (2)
- Also mentioned were entrepreneurship, analytical methods, consulting the public, catalysis, surfactants

## **8. How responsive to the changing world do you find IUPAC today?**



This is an area of clear concern, as most of respondents indicated that IUPAC is somewhat or not responsive to the changing world. This is something to improve as we are living in a volatile and ever changing reality (the pandemic is a good example of that), and we cannot afford to respond late or not at all to these urgent matters. More importantly, we are also suffering from not only the fake news but the use of technology to disseminate wrong and biased information. This demands a change in how we respond to news about chemistry. Other organizations have used the pandemic to increase their visibility making use of the technology (webinars, posts, social media...) to very more relevant in a time when verified information from credible sources is in high demand. If we do not respond, others will do.

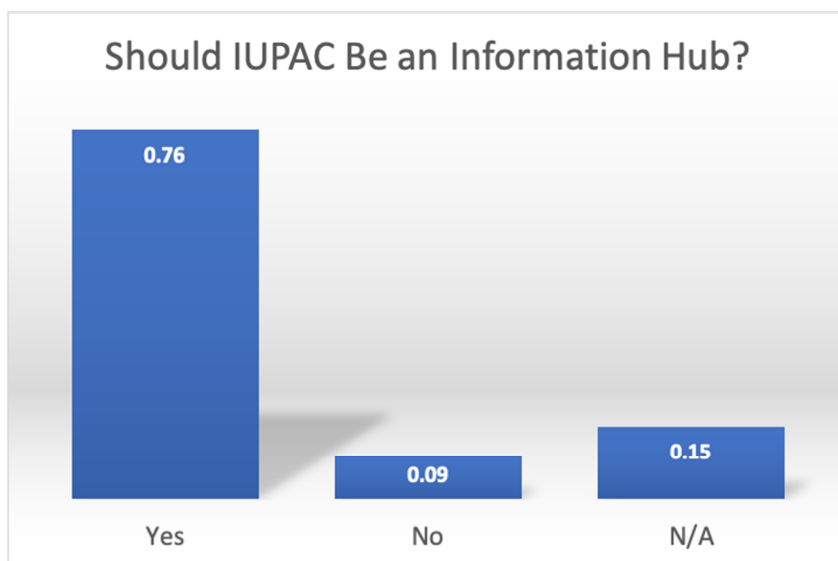
## 9. Some National Adhering Organizations (NAOs) have information of global importance (e.g. information relevant to Covid-19 or climate change)

These following two responses show a clear weakness of our organization and calls for a better coordination with our NAOs.

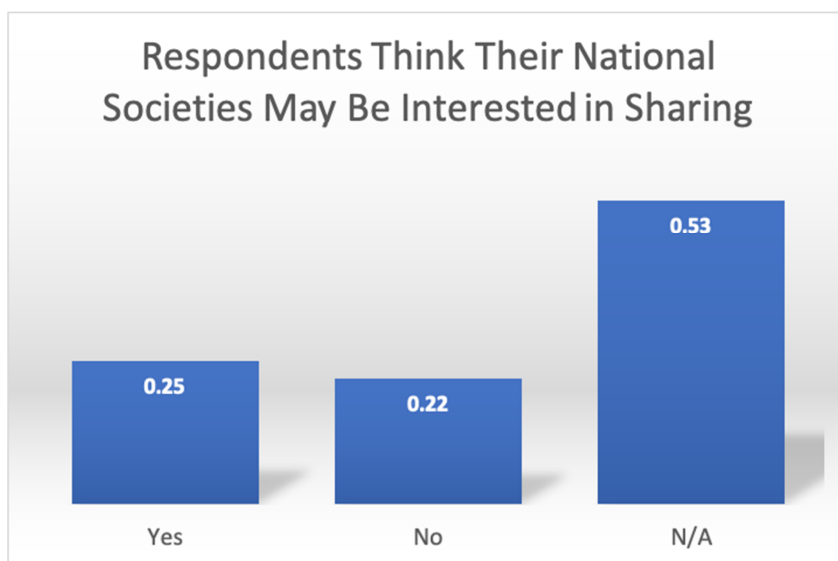
The vast majority of the respondents agree that IUPAC should be a hub for sharing information from global chemical societies. They identify this as a clear opportunity to gather relevant information in one single site as a way to increase IUPAC's visibility and relevance. However, almost half of those who responded do not think that they societies may be interested in sharing; although, most declined to respond. It is surprising, even frustrating, that the vast

majority of the people who completed the survey either do not or deny that their chemical societies would like to benefit from additional dissemination and visibility through sharing information with IUPAC. This calls for a more direct and frequent communication with the main chemical societies and federations, and for more joint activities.

**i) Do you think IUPAC should be a hub for sharing information from global chemical societies?**



**ii) If you represent an NAO, will your NAO or national chemical society be willing to notify IUPAC and let it broadcast your webpage or social media content?**



### **If you answered Yes above, what is your NAO?**

The following responds are from respondents who revealed that they are “2) Representative of a National Adhering Organization (NAO or associated NAO)” in the background section.

Australia: I can ask the Royal Australian Chemical Institute

Bangladesh: Bangladesh Chemical Society

Canada: The Canadian NAO and many Canadian IUPAC workers are sharing now I think that they might be prepared to consider an enhanced version, but they have to be asked and see what emerges

China/Taipei: Chemical Society Located in Taipei

Croatian: Croatian Chemical Society

Czech: Czech Chemical Society

France: Comité National de la Chimie

Germany: Deutscher Zentralausschuß für Chemie

Greek: Association of Greek Chemists.

Israel: Israel Chemical Society

Italy: Italian National Research Council - Consiglio Nazionale delle Ricerche, CNR

Japan: "Yes" is just my feeling. Science Council of Japan

Korea: Korean Chemical Society

Malaysia: Institut Kimia Malaysia or Malaysian Institute of Chemistry

Netherlands: Royal Netherlands Chemical Society (KNCV)

Nigeria: Chemical Society of Nigeria

Norwegian: Norwegian Chemical Society

Portugal: Portuguese Chemical Society

Puerto Rico: Colegio de Químicos de Puerto Rico, assuming there is no cost for the NAO.

Russia: Russian Chemical Society

Singapore: Singapore National Institute of Chemistry (SNIC)

Slovak: Slovak National Committee of IUPAC, within the Slovak Chemical Society

South African: South African Chemical Institute

Spain: Spanish Royal Society of Chemistry

Thailand: Department of Science Services and Chemical Society of Thailand

Turkey: Turkish Chemical Society

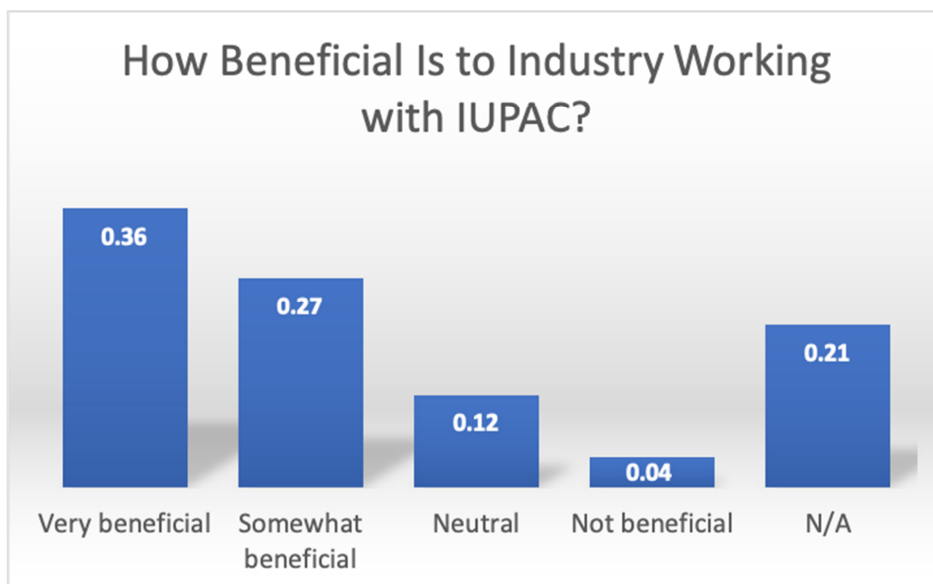
United Kingdom: Royal Society of Chemistry

Uruguay: PEDECIBA

United States: US National Academies

## 10. IUPAC wants to strengthen its links into chemical industry

### i) How beneficial is to industry working with IUPAC?



### ii) What should IUPAC do to improve its links to industry?

170 participants gave comments (37.9 %).

From this, 3 comments were "I do not know".

19 participants advised to be careful in the cooperation with industry:

- Industry would have a negative impact on IUPAC.
- IUPAC should be focusing on pure science, not applied science, and should stay independent.
- Industry would aim to make profit and did not always care about pollution.
- IUPAC should never take money from industry.

The main positive topics were:

- Involve more industrial people in divisions and task forces, seek and use personal contacts (32)
- Communicate more with industry, inform industry about services and beneficiaries, consult and offer support, make a value proposition (30)
- Invite speakers from industry, look for talented people, devise special and joint projects (17)

- Listen to industrial leaders and experts, reach out to CEOs, built advisory boards and respect each other (13)
- Organize special conferences where chemists and engineers meet, go to trade shows (11)
- Develop industrial young talent in workshops and courses, build networks and offer awards (13)
- Work with industrial organizations (7)
- Work more via COCI and CHEMRAWN, make both committees better known (6)
- Engage NAOs to reach out to industry (5)
- Work with industry in the fields of novel technologies (2)

## **11. In what ways could IUPAC serve its current members and volunteers better and more effectively?**

In general, respondents from all of the stakeholder groups made suggestions that fell into the following categories: Engagement/Assistance/Activities, Information/Communication, and Recognition.

### **Associated/National Adhering Organizations:**

Engagement – better dialogs; projects, workshops, meetings, conferences, best practices; tools to help NAOs; greater participation in governance; collaborations between NAOs; provision of quality standards (22)

Communication – better, more frequent, and more timely sharing of information from IUPAC to NAOs; advertising activities of the NAOs; support and assist smaller NAOs (19)

### **Company Associates:**

Engagement/Assistance: helping identify global challenges; networking between CAs; promoting best practices; facilitate participation in IUPAC bodies; capacity building; involvement in conferences, workshops, and divisions; developing programs that benefit industrial scientists (17)

Communication: More dialog with CAs; participation in IUPAC processes; learn from CAs about issues they find important; explain the underlying value in working with IUPAC (9)

### **Associated Organizations:**

Engagement: greater importance in the organization; joint projects and programs, workshops, conferences, meetings, future planning; membership in divisions and committees. Comments that AO are a neglected resource; AO need to understand IUPAC's role as a non-competitor with them (17)

Communication: more information; more participation in IUPAC processes (4)

**Affiliate Members:**

Recognition: provide certificates for contributions to IUPAC

Engagement: Make dues assessment easier; greater participation in IUPAC activities, including training; involve younger scientists; assist affiliates in their recommendations for their countries' science and education ministries; consultation with affiliates on a regular basis to define priorities; offerings like lectures, conferences and workshops (14)

Communication: make more scientific content available online; greater feedback; more frequent communication and contact with affiliates; monthly newsletter; CI in hard copy (15)

**Volunteers:**

Recognition: provide certificates for service; support to enable their participation (e.g. funding); public recognition on a regular basis (12)

Communication: Make CI available; newsletters; greater transparency; make publications free of charge (8)

Engagement: simplify organizational structure; workshops, meetings, conferences, etc.; invite volunteers to Division Committee and Standing Committee meetings; travel support; increase number of volunteers from third world countries; improve networking capabilities for volunteers (19)

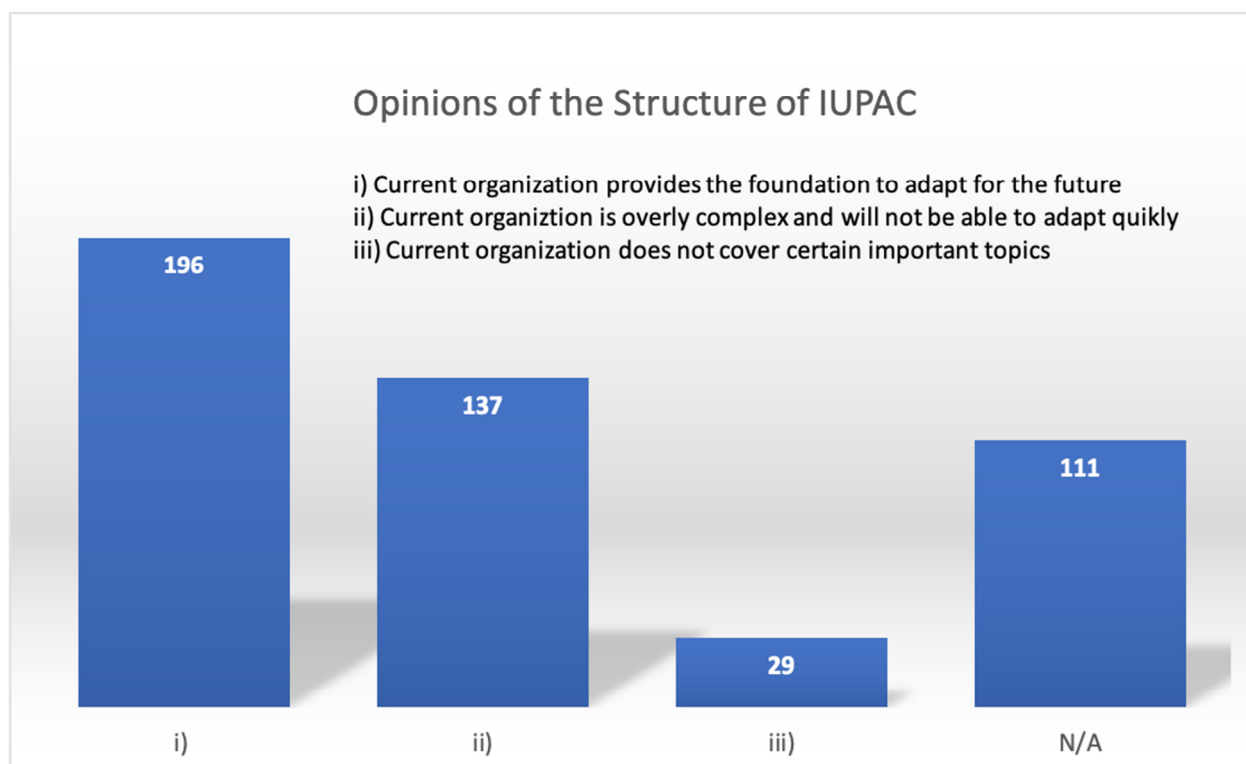
**Other:**

Engagement: greater funding for projects (2)

Communication: Make CI more readily available; create a historical archive of IUPAC activities; monthly newsletter; create awareness (8)

## 12. What is your opinion of the structure of IUPAC?

- i) The current organization provides the foundation for us to adapt for the future
- ii) The current organization is overly complex and won't be able to adapt quickly
- iii) The current organization does not cover certain important topics:



Note: There are 8% of respondents who chose more than one answer.

### If you answered the organization does not cover certain important topics, please list here

Scientific Fields/Structure: fields to include in the IUPAC structure (note that some of these are already included in the current division/committee structure):

- Informatics
- Digital chemistry and digital tools
- Societal issues and industry, societal issues and chemistry
- Interdisciplinarity
- Systems thinking

- Green chemistry
- two-dimensional soft nanomaterials
- meso-entropic matter
- carbon chemistry
- chemistry education
- bridge chemistry and pharmaceutical sciences
- solid state chemistry
- food chemistry
- computational chemistry
- catalysis
- ethics
- chemical engineering
- chemical biology
- materials chemistry
- Improved communications (2)

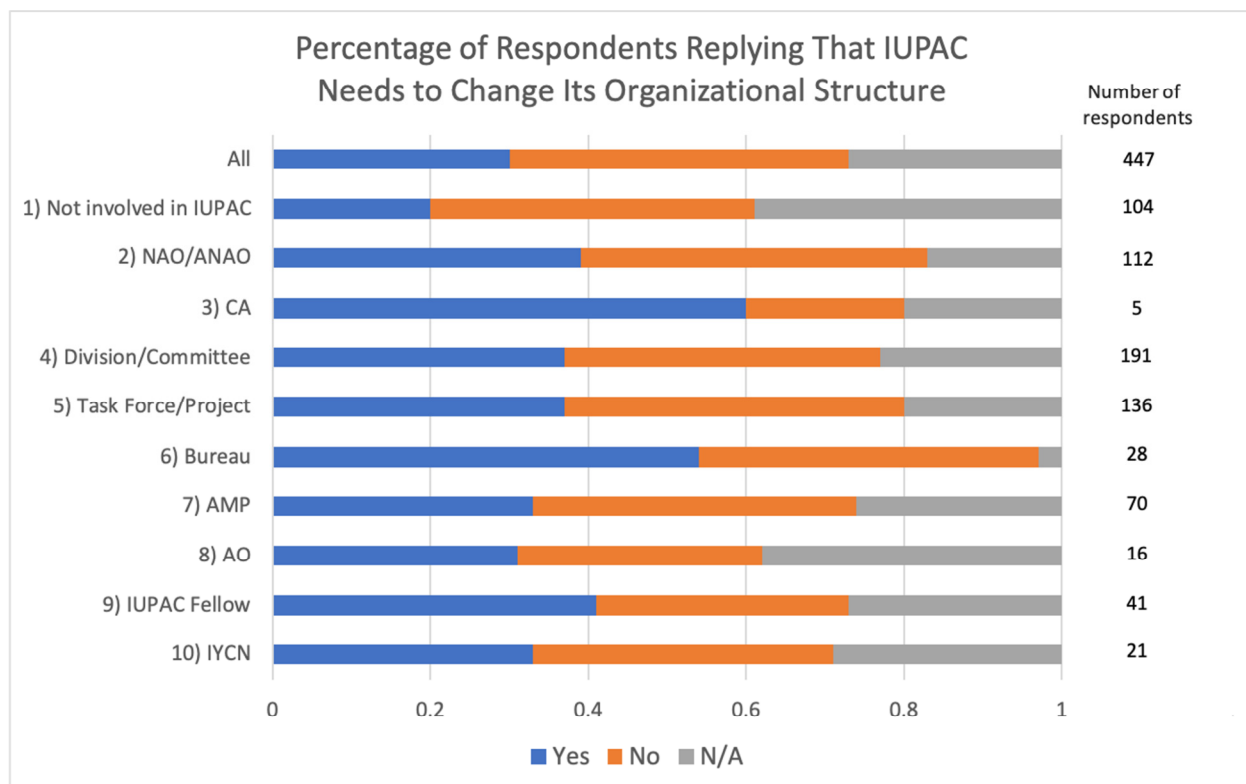
Structure: council meeting does not encourage engagement and discussion; organization is too complex and slow to evolve; need greater flexibility to adapt to covid-19 and reduced funding environment; greater simplicity; fewer division members; emphasize interdisciplinarity; top-heavy with academics; overly bureaucratic; emphasize virtual tools; consider alternative feedback and decision-making processes; better control of expenses; byzantine; involve more younger members, IYCN (17)

Engagement: involve more younger members e.g. IYCN; lack of planned circulation of membership in all committees (2)

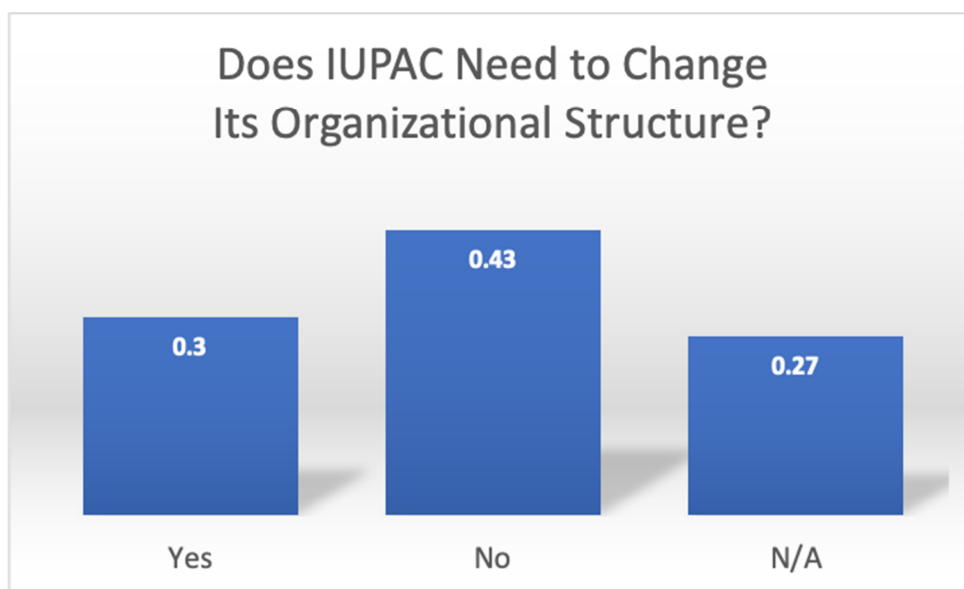
### 13. Does IUPAC need to change its organizational structure?

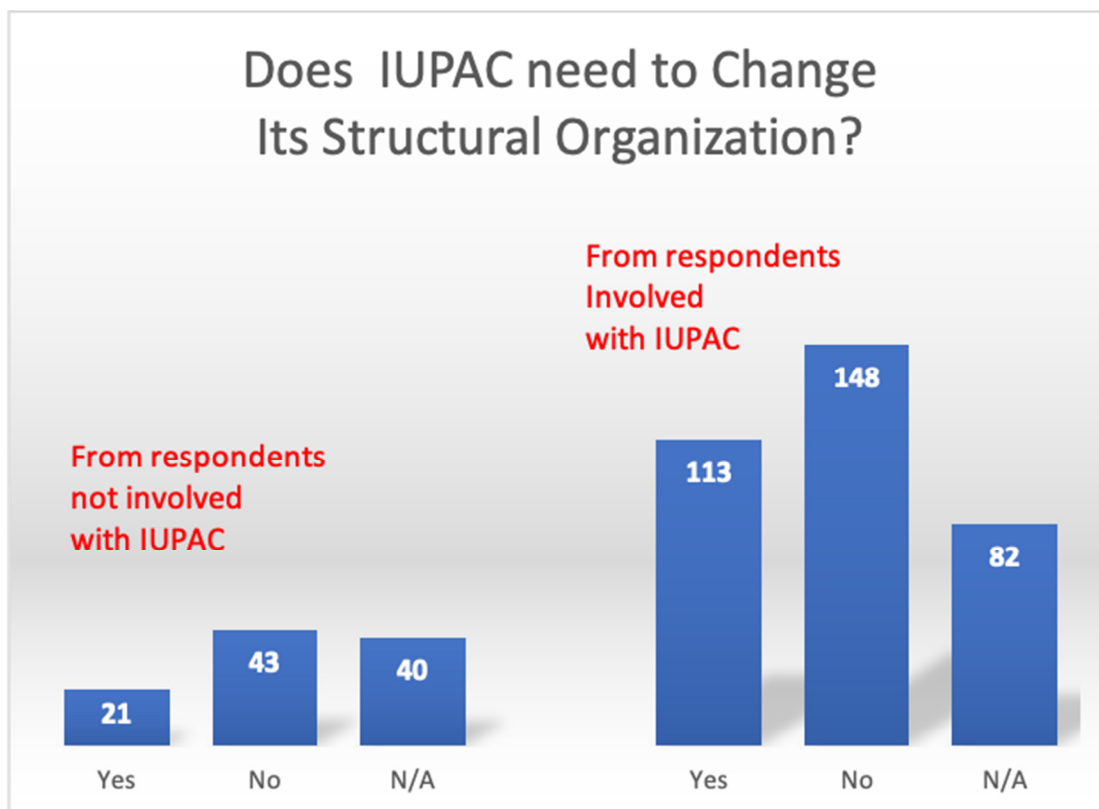
Table: The percentage and the number of total replies on whether IUPAC needs to change its organisational structure.

	Yes	No	N/A	Total replies
1) Not involved in IUPAC	0.2	0.41	0.39	104
2) NAO	0.39	0.44	0.17	112
3) CA	0.6	0.2	0.2	5
4) Division/Committee	0.37	0.4	0.23	191
5) Task/Project	0.37	0.43	0.2	136
6) Bureau	0.54	0.43	0.03	28
7) AMP	0.33	0.41	0.26	70
8) AO	0.31	0.31	0.38	16
9) IUPAC Fellow	0.41	0.32	0.27	41
10) IYCN	0.33	0.38	0.29	21



Note: Some respondents play several roles in IUPAC. Therefore, their replies appear in more than one category.





**If you answered yes above:**

**i) What changes would you recommend?**

Structure (63 responses):

- overly complex; too many committees and divisions; compress layers; fewer units without clear connection to divisions; reduce formality and bureaucracy; simplify; achieve a modern global community of engaged volunteers; digital tools and societal engagement;
- committees should oversee activities IUPAC wants to concentrate on; realign divisions around cross-cutting themes e.g data, terminology, sustainability; go back to commissions; traditional disciplinary boundaries are not forward-looking; reduce number of divisions; more research related structures; convert all subcommittees into committees; eliminate overlap of CHEMRAWN/ICGCSD; organize around one group (fundamentals) and another group (applications). Focus on applications.
- locate secretariat in a neutral place;
- assistant SGs; development officer, communications officer; communications committee; IT
- regional sub-units

- flexibility to deal with emergencies such as covid;
- are elected bureau members needed; reduce size of the bureau; implement proposal rejected in Beijing in 2005; redefine roles of Council and Bureau
- balance of short term projects and long term comprehensive programs
- Hold congress/GA every three years
- Eliminate TMs, reduce number of projects, reduce membership on standing committees, reduce overlap between divisions and standing committees

#### Engagement/Assistance/Activities (16 responses):

- IUPAC relies on busy, highly qualified professionals; simplify ways for volunteers to become involved; regular turnover of division/committee membership; TMs and AMs are not as effective as volunteers on projects;
- promote PAC and allow publication of research without fees;
- assist scientists in developing countries with funding for applied research
- more association with other scientific bodies; more involvement of NAOs; more proactive association with NAOs and assessment of their needs
- difficult to improve performance of underperforming parts of the Union or to end activities no longer needed; performance review process for divisions and committees

#### Resources/Finances/People (20 responses):

- organization needs to become less expensive to run; project system is perceived as travel grant program;
- too many, and too large, committees
- focus funding on projects not bureaucrats
- approach volunteers for assistance
- younger volunteers and more females; fresh blood; include IYCN in the Bureau; attract more young scientists under 40; new commissions of younger and active persons
- need to recruit and retain productive and high quality volunteers
- involve NAOs in areas such as education systems
- reduce expenditure on meetings
- more liaisons with other organizations
- abolish distinctions between TMs AMs and NRs
- Adhere to term limits
- Activate technological leaders as industry/platform leaders
- allow divisions to have more than one member from an NAO
- virtual meetings
- What is an IUPAC Fellow?

#### Science/Projects (11 responses):

- Do not terminate CHEMRAWN; ICGCSD is not an alternative;
- Prioritize science over geography and lobbies
- Review project results over last 20 years to determine whether they provided cutting edge science
- new divisions on drug development and entrepreneurship; better inroads into pharma and agrochemical companies; synthetic chemists and biologists needed
- new committee on the top emerging technologies and relevant issues; role for CHEMRAWN

Communication (5 responses):

- Communicate project results to NAOs; make project results easier to find; disseminate information about IUPAC projects to the general chemistry audience; make people more aware of the amount of knowledge present among volunteers and staff
- communicate at conferences about IUPAC contributions from the hosting area

Recognition:

- acknowledge the work of volunteers

Geographical/Other (6 responses):

- Assist chemists in smaller countries; recognize need for making recommendations available in other languages; include developing country representation in committees
- The Council is too large. Consider representatives from regions (Europe, North America, Central/South America, Western Asia, Eastern Asia, Southern Asia, Australia, Africa)

**ii) What do you feel are the principal organizational features that are needed for IUPAC to be more effective in the future?**

Communication (13 responses):

- Networking globally; contacts with affiliates, NAOs for better information and transparency
- Media promotion; visibility
- electronic media, webinars, podcasts
- internal communication between IUPAC leaders and members; regular summary of decisions and actions

Structure (26 responses):

- responsive and properly qualified staff; assistant to ED; development officer, communications officer, IT position; science based; better balance between work by staff and volunteers

- fewer layers; simpler structure; do fewer things; lean processes; fewer hierarchies; seek best practices from businesses, NGOs; experiment with models and change as needed; division structure should be more project-oriented
- proper balance in Bureau between members elected by Council and those representing divisions and committees; reduce size of bureau and council
- rework the divisions; too many subgroups and vested interests; too many barriers from new volunteers with new points of view

#### Engagement/Assistance/Activities (15 responses):

- involve more international contributors; more effective involvement of NAOs and business; NAOs more active in project system
- engage ministries of science and education, etc.
- more frequent online meetings; networking
- greater participation of volunteers in decision making; involve younger chemists
- find best practices among more innovative chemical societies, etc.
- concern about whether volunteer contributions can continue in the future
- better dialog among members

#### Resources/Finances/People (9 responses):

- attract high level scientists as volunteers; roles for young and mid-career scientists
- sort out finances; when stable, can focus on science
- recruit external expertise on structure
- control of project milestones, timing
- fundraising
- discussions with NAOs about future activities of mutual interest

#### Science/Projects (10 responses):

- use scientific conferences to develop new IUPAC projects
- implement a Scientific Committee
- workshops, training
- interdisciplinary work, outreach, identifying new areas within IUPAC expertise
- better mechanism for identifying and funding new initiatives
- SDGs as basis for setting priorities
- greater emphasis on biology-related areas
- the world cares about applications and involvement of younger generation

#### Geographical/Other (6 responses):

- focus on quality not quantity

- focus on geographic and scientific fields that would improve visibility of IUPAC – federative model for NAOs

**iii) Are there other organizational or operational models of which you are aware that would be more effective or intrinsically less costly?**

- Primarily virtual secretariat with a small office (7); one person suggested using an open-source content management system
- IUPAC conferences should have a hybrid model of in person and virtual attendance (6)
- Flatten the management algorithm
- Involve more younger scientists
- Connect funds to responsibilities
- Have a top-level (officers?) to direct strategically, no micro-management nor committees under the guidance of this top-level governance. Combine this board with representatives of each division to decide on the budget. Trust the divisions to apply the budget correctly within the period (two years?).
- Ideally a 'bureau' of about a dozen members and a 'council' about twice that size would work more efficiently.
- Most international unions function without an extensive Bureau-like governing body, but rather have some form of representation of persons in sub-fields on their governing bodies, on a rotating basis.
- hard to list because of the strong focus on standards and nomenclature in IUPAC and limitations in adapting to readily available technology, training and experience that exists in the field today

Organisations to follow:

- SETAC
- ACS
- GdCH
- RSC
- EuCheMS

Note that 2 people suggested that it was time to move the secretariat

**iv) In what ways could IUPAC simplify the administrative tasks and processes undertaken today?**

- Web-based interactions and tools (13) (specifically mentioned in place of email...), meetings, financial management, project submission and evaluation, record keeping, informational tools
- Reduce number of tasks and stick with core business; fund fewer projects
- Trust elected units but hold them responsible
- Engage with younger, active members of the community
- Make the secretariat virtual, decentralise activities (2)
- Increase administrative support to divisions
- Organisation structure - while some felt that the structure is ok as is, there was a greater proportion that commented that the structure is overly complex (12)
- In particular the Council is difficult - it is necessary in a governance sense, but it results in poorly informed delegates voting on major decisions, e.g. where to hold General Assemblies - really this is best decided by Division and Standing Committee members, however relatively few of them participate in Council.
- It is necessary because almost everyone in IUPAC is a volunteer, and volunteers need recognition. This is achieved by having a plethora of positions - if you can't give someone money for their work, then you have to give them a title. A leaner structure would create greater efficiency and alacrity, but it would reduce the workforce, because university employees need something to show their bosses for their efforts.
- The majority of the decisions should be done by max. 3 persons during max 7 days. So the system should be less formal and more flexible.
- Reconsider the role of the Executive Committee
- Hold administrative meetings quarterly and publish it's agendas and proceedings
- Amalgamation of the administration with other international science bodies - may allow better sharing of resources and best practice
- Suppression of Redundant Committees (4), such as ChemRawn, and Merge ICGCSD with Division Chemistry and Environment

## 14. What steps would you suggest for IUPAC to secure its financial sustainability?

### i) How can IUPAC increase revenue?

#### Short Courses/Conferences/Consulting (27 responses):

- run short courses using education volunteers; courses run by NAOs sharing profits; IUPAC receive percentage of registration fees; accredited virtual courses for professional development
- conferences with funding from exhibitors; symposia (but overload on conferences now worldwide)
- workshops
- consultancies
- certifications; award and events

#### Fundraising/Endowment (23 responses):

- seek initiatives of interest to independent funders;
- use non-profit status to help recruit donors
- research proposals to foundations
- projects should have outside funding as well as IUPAC support
- paypal, etc for small donations; crowdfunding
- set up a foundation or endowment; funded by industry;
- „Tobin“ tax on international money transactions could be used to fund international organizations
- IUPAC shop
- hire a marketing manager

#### Industry/Company Associates (40 responses):

- ask major chemical companies for donations
- explore industrial sources outside the major chemical giants
- fund projects that benefit industry; contracts for collaboration with industry
- increase CA membership
- present a value proposition for industrial participation
- sustainability and the environment are topics for collaboration with industry
- trade associations
- sell advertisements on IUPAC web site and publications
- approach companies via personal contacts
- use social media to gather interest and ideas from industry

#### Monetizing Assets/IP (14 responses):

- leverage digital assets, invite partners to sponsor the assets
- manage some IP to obtain revenue; sell information, standards, and pubs via internet
- sponsored webinars, etc.
- competitions with paid admission, e.g. quizzes
- merchandising; IUPAC store
- journals, books, conferences, training courses; branding

#### Publishing (10 responses):

- higher impact publications
- journals, books with IUPAC branding
- loss of publication revenues – difficult to replace
- charge fees for standards recommended by IUPAC
- set up IUPAC's own publishing business independent of deGruyter

#### Membership recruitment/retention (20 responses):

- work hard to retain current members
- find out why NAOs leave
- start chemistry-related NGOs
- building collaborations and links
- constant interactions with current members
- allow physicists to join
- develop and use regional committees and networks
- emphasize individual (affiliate) and corporate (CA) memberships
- offer free membership to students; associate with colleges and universities
- help NAO's grow their research capabilities
- greater involvement of affiliates

#### National Subscriptions/Dues (18 responses):

- Increase the NS, dues for affiliates and CAs
- seek members independent of national chemical societies, etc.
- establish better mechanism for collecting NS

#### Decreasing Spending (4 responses):

- simplify procedures and reduce administration

#### Other (10 responses):

- promoting supporting organizations
- spreading knowledge about IUPAC's universal activities
- Supply things for which there is a demand
- appeal to more chemists; serve developing countries

- become more relevant w.r.t. science and technology
- position IUPAC as a global solution provider
- Careful consideration of all sources of funding
- „screen off the surmounted/ing ‚servitude‘ referral system

## **ii) How can IUPAC lower its operating costs?**

### Virtual Meetings/Operations/Reduction of Travel (51 responses):

- all the responses basically recommended moving entirely or mostly to virtual meetings and videoconferencing; in person meetings should be self-funded; GA and Congress should be in-person, but Bureau meetings should be virtual (some also thought that Council could be done virtually);
- recognize that face to face meetings, especially at the start of a project, are important; over-reliance on virtual meetings takes away from the benefits of interpersonal contact

### Information Technologies (2 responses):

- increase use of IT among management

### Secretariat and Operations (19 responses):

- relocate the secretariat; locate in the HQ of an NAO; virtual office;
- reduce the number of staff; reorganize;
- discontinue mailings
- examine the 70/30 funding ratio for divisions (projects/admin)
- simplify project funding system
- reduce international bank fees

### Structural/Organizational Changes (12 responses):

- fewer members of divisions; merge standing committees and interdisciplinary divisions; eliminate TM position
- too many officers and administrations
- reduce size of the Bureau
- pruning less productive parts
- reduce the number of sponsored conferences
- review every item on list of expenditures and cut non-essential activities and ineffective projects

### Project Funding (1 response):

- project budgets could be reduced substantially if meetings occur virtually

Publications (2 responses):

- Abandon PAC; make technical reports etc. available on Web site instead

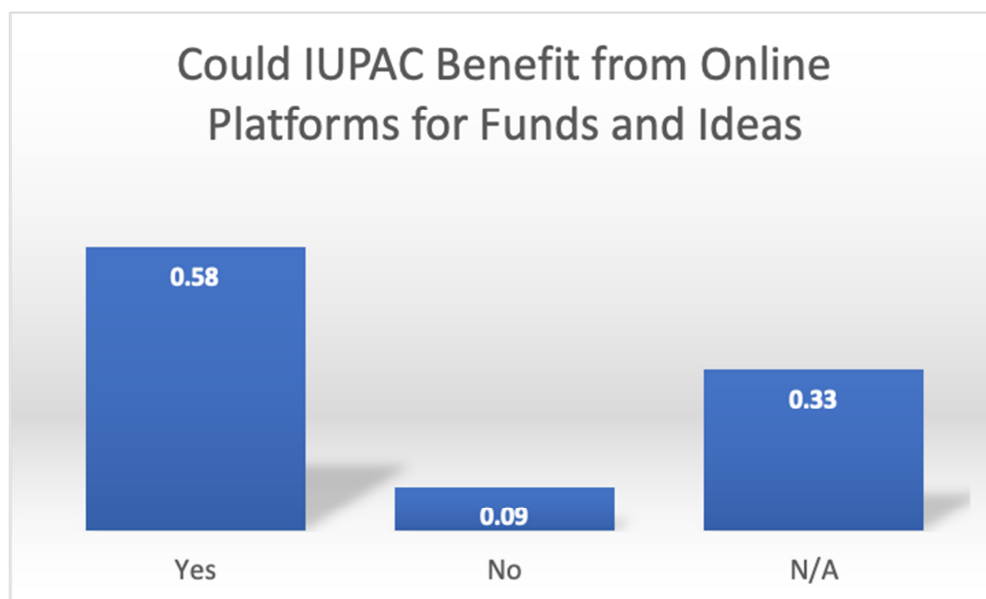
Increase income (3 responses):

- solicit donations from industrial sponsors
- more advertising
- focus on fundraising

Other (11 responses):

- IUPAC is already lean – short of ideas on how to reduce costs
- establish partnerships
- move to online publications
- seek more volunteers
- do fewer things better

**15. Could IUPAC benefit from using online platforms to solicit funds and ideas from the chemistry community?**



**Comments**

This seems to be an interesting idea for most of the responders, but a large fraction does not know or doubt that this could be done or that would be beneficial. Probably, the question is too broad and needs some definition for people to have an educated opinion about the use of online platforms (which ones, how would be used, ....?) to solicit funds and ideas from the chemistry community and more importantly to actually get those.

### **Final comments if topics of your concern are not included above**

- The fragmentation into separate divisions leads to recommendations on nomenclature that are established by a narrow divisional committee and imposed on the wider membership that had never been consulted on those recommendations.
- In my experience use of a Recommendation is rather variable from a specific situation for a measurement of a physical quantity eg 2011-038-1-100 Definition of transfer coefficient, which I consider to be a good example according to 'the rules' to a wide range of terms within a glossary such as the Chapters of the Orange Book, which very much contrasts with the previous example. I have been involved directly and indirectly in both of these examples and am surprised that they can both be treated as Recommendations.
- I suggest we brand terminology (IUPAC Recommended Term = IRT), critically reviewed data (IUPAC Recommended Value = IRV) to go with Nomenclature.
- Election process of president and officers should also be reviewed.
- My opinion is that IUPAC could strengthen the Mission of Chemistry - Pure and Applied - for "Sustainability under its many dimensions and making reference to the revised SDGs". To make this not only a political statement, IUPAC might reconsider its operational structure by moderating the centralized approach:
  - Developing a specific light structure to reveal, monitor and address the outcomes, achievements and projects that match the main needs ahead;
  - Collaborate with the NAOs network to call experts at international level ( many already in the Divisions and other excellent scientists ) to engage in lectures, advice, leadership in selected emerging technologies areas
  - Invest in the establishment and provision of access to a repository to make available store information. The knowledge organization could exploit the Periodic Table for Elements as the classification crossed with SDGs objectives such as Energy, Food, Health, Safety etc.
  - Prepare youngers through relevant outreach initiatives like the PT Challenge : gamification, web school lessons, occupational campaign and territory focus
  - Create trusted connections with Funders such as Herbert Simon Foundation, Bill Gates Foundations, Mc Arthur Foundations, Kessler Foundations (and so forth) to support IUPAC initiatives. Contact with Funding Agencies at National Level would also be extremely relevant for supporting collaborations and visibility in the post-covid time.

- Improve exchange of activities with the International Science Council to develop joint and strengthened positions on societal topics such as recently Racism, Freedom of Science, Access to relevant info etc.
- Improve the articulation of IUPAC NAOs in selected areas (key emerging Technologies) to cultivate excellence in these macrotopics and gain support from country specific experts (in rotation). This will build value creation through projects and collaborations. Maybe it would be an idea to nominate a liaison person from the IUPAC Management to keep these contacts alive, continuous and fruitful.
- IUPAC's activities, main goals and otherwise, as described in the strategic plan, must be founded on scientific excellence

# **IUPAC Organizational Structure Review Group**

## **APPENDIX III. Survey Summary [Responses Submitted Directly from NAOs]**

### **Background information of the respondents**

#### **On behalf of which NAO are you completing this form?**

Six NAOs responded to this survey, and one other NAO wrote a letter to the review group with comments related to questions in the survey.

### **Survey Results**

#### **a. Current Status**

##### **1. In your view what is the importance of the various activities undertaken by IUPAC?**

###### **i) Setting/recommending standards**

<b>Very Important</b>	<b>5</b>
<b>Quite Important</b>	<b>1</b>
<b>Important</b>	
<b>Somewhat important</b>	
<b>Not important</b>	

###### **ii) Identifying and sharing key chemical technologies**

<b>Very Important</b>	<b>2</b>
<b>Quite Important</b>	<b>3</b>
<b>Important</b>	<b>1</b>
<b>Somewhat important</b>	
<b>Not important</b>	

**iii) Capacity building worldwide**

Very Important	1	
Quite Important	3	
Important		
Somewhat important		2
Not important		

**iv) Publishing**

Very Important		
Quite Important	3	
Important	3	
Somewhat important		
Not important		

**v) Networking**

Very Important	4	
Quite Important	1	
Important		
Somewhat important		1
Not important		

**vi) Honoring**

Very Important		
Quite Important	4	
Important		
Somewhat important		2
Not important		

**vii) Other**

Very Important	1	
Quite Important	1	
Important		
Somewhat important		
Not important		

**If you answered Other above, please describe**

1. Leadership
2. Comments: It is not clear how the categories for the questions above relate to the five categories of 'Current Activities'. If question ii) incorporates Sustainable Development Goals (SDGs) and Cheminformatics and Data Standards, then the importance of ii) is increased.
3. Publishing, networking and honouring are only of secondary importance/required with respect to i) and iii) and for recruiting a solid base of volunteers.
4. Need of a High Level selection Committee – Membership of International Organization

**2. For each activity below, to what extent is IUPAC's work unique or distinctive with regards to other chemistry-based organisations or similar scientific organisations?**

**i) Setting/recommending – Nomenclature/terminology/symbols**

low	
medium	
high	6

**ii) Setting/recommending – Other standards**

low	
medium	
high	6

**iii) Identifying and sharing key chemical technologies**

low	2
medium	2
high	2

**iv) Capacity building worldwide**

low	1
medium	2
high	3

**v) Publishing – Books**

low	2
medium	2
high	2

**vi) Publishing – Journals**

low	3
medium	3
high	

**vii) Publishing – Databases**

low	1
medium	2
high	3

**viii) Networking**

low	
medium	4
high	2

**ix) Honoring**

low	1
medium	3
high	2

**x) Other**

low	
medium	1
high	2

**If you answered Other above, please describe**

1. Leadership
2. IUPAC is a *global* organisation and can bridge continental/regional organisations

**Comments**

Other chemistry-based organizations are much more accessible and they publish high-profile journals.

Publishing – Books: Included in our assessment of books are the ‘Color Books’ – the books which set put the principles of nomenclature and units/symbols in all branches of Chemistry including Clinical Laboratory Sciences. ‘Books’ encompass both hard copy and digital – online resources are more important now than hard copy books.

**3. What benefits do you receive from IUPAC's activities?**

As an organization, we benefit from leadership in terms of nomenclature, standards and the sharing/identification of new chemical technologies. The opportunity to share chemistry with a broad audience such as activities related to IYPT and to promote equity & diversity in science via initiatives such as GWB.

Networking across disciplinary boundaries and globally is also very important, and facilitated through the chance to host IUPAC sponsored meetings/conferences.

Networking and collaborating with top international chemists. Making a significant contribution to the promotion of chemistry worldwide.

International Networking and collaboration; having the standard chemical nomenclatures and terminology

See also 4.

In principle we get some information.

**4. When you review the range of activities undertaken by IUPAC today, and the resources IUPAC has, do you feel that:**

**i) There are important gaps    2**

**ii) IUPAC has it about right    4**

**iii) IUPAC is spread too thinly and under-resources important activities    2**

**Please explain your selection(s) above**

IUPAC cannot do everything but what it does it does well – so it is about right. It is important to maintain excellence in terms of setting/recommending standards and sharing this. Clearly, it is impossible to compete with world leading journals (e.g. JACs, Angew. Chem., Chem Comm) but it is still good to be active in publishing and the IUPAC-endorsed conferences are well-respected around the world (and this is a good thing given the number of predatory conference organizers)

The combination of projects leading to recommendations, and the sponsorship of international conferences provides the best level of basic activity.

personal participation experience

1. Activities and funds seem only very loosely coupled.
2. IUPAC needs to use its international platform to advantage and make contributions to the growing trend toward Open Science.

The major benefit from current activities is in the work of the nomenclature committees and the associated publications. For the future, the IUPAC needs to address the fact that chemical knowledge and data should be FAIR (FAIR = Findable, Accessible, Interoperable, and Reusable) and this implies provision of metadata for published compounds. Linked to this is the provision of a machine-readable name of a compound. CAS numbers are commonly used for compound identification but include no structural information.

IUPAC budget is not in adequation with the goals

## **b. Looking to the Future**

**5. Do you feel the most valued and distinctive activities for IUPAC will significantly change in the next decade? Please explain your choice below.**

Yes     3

No       3

### **5i) To what extent and in what ways?**

We need to continue to promote chemistry and stress its importance in contributing to the solution of the most pressing issue of our time, namely global warming. This will also help engage a younger generation (e.g. school strikes have been impactful with young adults at this time) and work towards disabling so-called 'fake news'.

Organizing worldwide conferences.

The *most* valued and distinctive activities (=nomenclature/terminology/symbols) will probably not change drastically. the details within this broad range will of course change a lot and needs to reflect development of metadata for Open Science.

We do not think that IUPAC will change in the next decade even if it is highly needed

For example: virtual meetings will substitute several face to face meetings

### **5ii) In what areas should IUPAC be focusing in the future and why?**

See above

The issues are the same

Sustainable chemistry and green chemistry

Chemistry education

Gender equality in chemistry

Digitalization of chemistry/chemical research will require an adaptation of the chemical language.

The former role of facilitating scientific connections between east and west may become needed again.

IUPAC should become relevant to industry and regulators again.

Create a real interface in between industry and academic science. Create a scientific committee to provide high level expertise including on societal issues.

Environmental, Chemistry and Society

### **6a) How can IUPAC adapt to the evolving needs of the chemistry and chemical engineering community?**

No Comment

By promoting excellence in research and integrity in the application of discoveries.

Joint project for promoting chemistry

Be relevant enough, so that the highest level of chemists want to work for IUPAC (as was the case decades ago). Have the “right” volunteers in deciding positions and grant them freedom, of course within a defined budget.

Improve IUPAC ability to attract very high-level chemist (academic and applied)

### **6b) How can IUPAC reach out to new beneficiaries? And who might they be?**

No Comment

IUPAC should make a stronger effort to include chemical industry, without losing its neutrality.

To promote the positive image of chemistry to all generations of the people in the world.

Offer a good Company Associate program with real benefits.

Improve IUPAC ability to attract young chemist and scientist of developing countries

Improving information, especially the web page, contacting new possible beneficiaries

### **6c) How might IUPAC better reach and engage with chemical organizations and societies?**

A difficult question there is no easy answer nor is there a single solution, especially as some organizations are perhaps more engaged with IUPAC than others (e.g. they are the reps for the NAOs. This is not the case for Canada but we invite the executive director to be ex-officio in our NAO committee meetings and they are always involved in co-sponsoring IUPAC conferences hosted in Canada). In the current pandemic, it might be worthwhile pursuing virtual events together to achieve a maximum global audience and reduce duplication of efforts.

By being prepared to take the risk of being accused of accepting influence from commercial organisations.

IUPAC is a big umbrella of the chemical societies across the world. Take this advantage as a leader,

IUPAC can propose some initiatives for linking them together for special events or issues. Strengthen the services and enrich the contents of website.

Assume the role of umbrella organisation above the continental and regional organisations. To reach national organisations, address the NAOs. NAOs represent all the organisations in their territory.

Whomever you want to reach and engage, offer them a relevant position (in governing bodies.)

Include the organizations in the government bodies of IUPAC

Contacting them directly

## **7. Which areas of chemistry or chemical engineering are not currently reflected within IUPACs structure?**

More emphasis on climate change

None: there is room for every aspect.

The IUPAC Color Books do reach beyond the classic organic/inorganic/physical disciplines, but the IUPAC should address the extent of multidisciplinary (e.g. climate actions, environment, system thinking, ...), as well as more targeted fields (e.g. health, materials, energy...).

Chemistry for Energy, Chemistry for Health, Chemistry for Environment, Chemistry of and for Resources, Chemistry of Materials, Interdisciplinarity and system thinking

## **8. How responsive to the changing world do you find IUPAC today?**

Not responsive            1

Somewhat responsive            3

Responsive            1

Highly responsive            1

## **9. Some National Adhering Organizations (NAOs) have information of global importance (e.g. information relevant to Covid-19 or climate change)**

i) Do you think IUPAC should be a hub for sharing information from global chemical societies?

Yes    5

No    1 (Comment: IUPAC is not a news agency and 'open science' uses other channels.)

ii) If you represent an NAO, will your NAO or national chemical society be willing to notify IUPAC and let it broadcast your webpage or social media content?

Yes 5

No

If you answered Yes above, what is your NAO?

## 10. IUPAC wants to strengthen its links into chemical industry.

### i) How beneficial is to industry working with IUPAC?

Very Beneficial 1

Somewhat beneficial 1

Neutral

Not Beneficial 2 (Comment: 'Not beneficial' at the moment. IUPAC should become relevant to industry and regulation again.)

### ii) What should IUPAC do to improve its links to industry?

We have been trying for many, many, many years with very little success. Industries focus on short term profits makes them reticent to get involved with anything that is not of immediate relevance to that goal.

Provide advice for industry in return for funding support, and deal with this to ensure no conflict of interest.

Invite NAO to collaboratively work on organizing worldwide chemistry and chemical engineering conferences.

Chemical industry uses IUPAC-generated knowledge, but most is rather old/established. To work directly with IUPAC does not seem to be beneficial (generate "value") for industry.

COCI should be relevant and should know what industry really needs from IUPAC. If industry is supposed to contribute to (and profit from) IUPAC, then industry should have a say (in governing structure).

Industry used to be relevant to IUPAC (they provided the secretariat "for free" and paid large parts of the national memberships).

→ Ask the industry!

- IUPAC members should listen to industry leaders which has not been the case during the Paris Event.

- IUPAC should present industry a very strong value proposal. The Paris attempt to attract industry must be followed!
- COCI should be a division

Contacting the industry and chemists who work in it.

## **11. In what ways could IUPAC serve its current members and volunteers better and more effectively?**

### **Associated/National Adhering Organizations:**

Strengthen their role. they are members of the association, *include* them. The NAO are the bridge towards the chemists in a nation. Inform them and stay in contact: e.g. why was the Swiss NAO never contacted by the MRS despite the Swiss criticisms (letter from 2016), or why does the Swiss NAO neither know who in Switzerland is an affiliate member, nor which company has a PAC subscription? Switzerland is also not informed from IUPAC when new Swiss volunteers are recruited. Nor did the Swiss NAO ever receive an answer to the question about why Tomasz Walczyk has been listed with the Swiss NAO despite being in Singapore for a decade!

Work *together* with the NAOs.

Ask those NAOs who quit.

Reinforced the NAO position in government bodies

### **Company Associates:**

Ask those who quit. Ask the industry what their needs are.

### **Associated Organizations:**

### **Affiliate Members:**

When the IUPAC secretariat took over the management of the Swiss affiliate members, the existing members were not even contacted to continue/renew their membership. Do not expect, that affiliate members flock to IUPAC if you do not even ask them.

Ask the remaining AMs what they need?

Yearly consultatation of Affiliate members

**Volunteers:**

Keep the administration minimal. e.g. is reimbursing expenses by the receipt really cheaper than by lump sum? It's time-consuming for both involved parties.

Attract and elect brilliant, committed people and give them freedom within clearly communicated boundaries.

**Other:**

In our opinion, I believe that IUPAC could help us a lot by helping logistically and financially to national congress (with strong participation from scientist from all the world). As is in our case, the National Chemistry Congress (ENACUI), which is our most important national chemistry event in the country.

**12. What is your opinion of the structure of IUPAC?**

- i)      **The current organization provides the foundation for us to adapt for the future**  
2
- ii)     **The current organization is overly complex and won't be able to adapt quickly**  
3
- iii)    **The current organization does not cover certain important topics**  
1

**If you answered the organization does not cover certain important topics, please list here**

See above (7.)

Societal issues and industry, interdisciplinarity and system thinking

**13. Does IUPAC need to change its organizational structure?**

**Yes**     3

**No**      2

**If you answered yes above:**

**i) What changes would you recommend?**

Replace the Bureau and Executive Committee with an Executive Board, as was proposed back in 2004.

Drastically simplify the structure.

Avoid micro-management and do couple decisions to budget.

Put an expiry date on everything, even divisions. New activities/fields can be easier established when old things can be stopped (as a price for new things).

NAOs are the members of the association, they should not only convene every two years to formally say, “yes, continue”. They should be *included* and be part of it.

More implication of the NAOs

**ii) What do you feel are the principal organizational features that are needed for IUPAC to be more effective in the future?**

Committee structure should be leaner and turnover of members should be smoother. Rules for terms of office should be adhered to. Too many committee members hang on for too long.

The current bureau is much too large to be effective. Who should be represented there apart from the officers? Maybe the fewer, new divisions/sectors and no committees?

Qualifications for the representative posts (e.g. president) are very different from managerial posts (e.g. president) – it seems, the old structure was intended to decouple these by having a president and a (volunteer-) secretary general. However, I have the impression, that the president is expected to be representative as well as a manager. Should the roles of the officers be re-defined?

Equilibration of the roles between the divisions and the NAOs

**iii) Are there other organizational or operational models of which you are aware that would be more effective or intrinsically less costly?**

The previously mentioned Executive Board.

Reimburse on simpler models than on receipts. Does it really hurt if someone sleeps in a shach and pockets a minimal amount of money for that? After all, he/she is doing work for IUPAC which would be worth much more than this symbolic amount.

However, there are not many organizations left which pay for hotels as expensive as IUPAC does.

**iv) In what ways could IUPAC simplify the administrative tasks and processes undertaken today?**

Already mentioned.

Simplify the structure.

Communicate in clear and correct ways instead of recalling emails and sending corrections (may sound like a detail but is the base for productive work).

Dramatically reduce the Numbers of committees and divisions

**14. What steps would you suggest for IUPAC to secure its financial sustainability?**

**i) How can IUPAC increase revenue?**

NO COMMENT

Encourage funding from industry in return for providing access to latest chemical developments, for example through a newsletter.

Organising conferences is a big business (see e.g. why “predatory conferences” exist). The World Chemistry Congress should *at least* pay for the general assembly it may even generate income.

**ii) How can IUPAC lower its operating costs?**

NO COMMENT

Reduce payments for travel. Possibly have Council meetings every three years instead of every two, but this would require adjusting the terms for officer and committee membership.

Find an NAO, university or company to host the secretariat. You could share HR, finances, IT from the host and only pay for the resources actually used.

- Reducing expenses of the key activities guaranteed by IUPAC volunteers. Continually switch (where it is possible) to the online meetings of IUPAC units of all levels instead of short-time meetings where refunds of travel costs, accommodation, etc. are needed.
- Savings on the annual expenses of the secretariat and administration should be reduced if compared with the topical level. The everyday „management“ workload and duties of secretariat and administration unit should be analysed and reduced to a minimum level (some of these are already done also „on the volunteer basis“).
- An issue is also the localisation of the secretariat of IUPAC. Some 25 years ago, the IUPAC Secretariat was transferred from U.K. to U. S. Maybe it is now time for the next transfer, for example to a Central European country, where both the salaries and price level are incomparably lower than in the U. S. (for example: the average salary in Slovakia is about 1.100 € per month before tax). Similarly, the printing and postage prices are much lower here than in the U. S. The highly specialized activities can be mastered by the electronic post, anyway.

## **15. Could IUPAC benefit from using online platforms to solicit funds and ideas from the chemistry community?**

**Yes**     2

**No**     1

1 Hard to know

### **Comments**

Possibly - depends on how this is done, but if it was successful it could result in a reduction of funding by other methods.

1. IUPAC has several influential activities to involve students and public in chemistry across the globe, such as Periodic Table Challenge. IUPAC can use those initiatives as vehicles to invite chemical organizations to make their contributions (such as donation) to those highlights as their social responsibilities.

2. IUPAC can collect small amount of donation from chemistry community to specific programs (such as Young Ambassadors for Chemistry, Flying Chemistry Educators Program) from NAO so that those programs can be sustainable and beneficial to more countries.

Online platforms are tools to be used. They do not generate income or ideas. They are tools, not gold mines (but by all means use them where applicable!)

## **Final comments if topics of your concern are not included above**

Thank you for doing this structural review. Thank you also for counting the NAO's views separately.

### The key issues of the IUPAC's purpose for its stakeholders.

- Materials chemistry:
  - It is insufficiently reflected.
  - It would be timely and useful to create a division of Material Chemistry.
- Chemical engineering for chemical industry:
  - To engage chemists working in the production processes more tightly in the IUPAC activities by both sides beneficial invitations to IUPAC membership and structures.
  - To obtain/increase the necessary financial support from the industrial bodies in addition to or (preferably) alternatively to the national subscriptions .
- Contribution towards identification of challenging issues of chemical research and technology:
  - To guarantee it further; not only panel of experts and annual „Top 10“, but also new Committee (alternatively CHEMRAWN should be re-focused towards these issues).
  - To better adapt not only to challenges but also to the evolving needs of chemistry and chemical engineering.

### How can IUPAC be more visible for individuals?

- To give larger space for presentation of Chemistry olympiads and Chemical societies within IUPAC web, General Assembly; hand-in-hand with Chemistry olympiad teams and NAO members.
- To communicate more closely with universities, and the research Institutes but also to prepare a world-wide activity focused towards registration of chemists (cf. medical doctors, dentists, etc.) by introducing International / Worldwide Professional Chemists Cards

## **APPENDIX 4 - Abstracts of Papers from Colleagues of Prof. Zhigang Shuai on Emerging Areas in the Chemical Sciences**

### **Summary**

#### **Prof. Zhigang Shuai**

The following abstracts summarize the breakthroughs of recent chemical researches and foresees the future direction of chemical studies. Research areas of chemistry today have been classified into eight branches: Synthetic chemistry, Catalytic chemistry, Theory Computation, Material and energy chemistry, Chemical detection and measurement, Chemical biology, Environmental chemistry, Industrial chemistry and chemical engineering. Several growing directions have been analyzed as the future front of chemistry, such as novel efficient and green synthetic methods for important molecules and complex structures, rational designed catalysts for central chemical process, combination of different theoretical and computational methods including artificial intelligence to be applied to the dynamic, disorder and non-equilibrium situations, energy utilization efficiency and energy diversifications, new techniques and analytical methods for important microscopic and macroscopic chemical systems, selecting appropriate targets in biological systems and adopting more rational design strategies for development of innovative and sustainable diagnostic technologies and medical treatment, methods to solve the complex pollution problem efficiently, the production and manufacturing of chemicals in industry. This work provides a comprehensive and in-depth analysis of the current major trends in chemical research and provides guidance for the development of chemical disciplines in the coming years.

### **1. Synthetic Chemistry**

**Chao Liu, Lanzhou Institute of Chemical Physics of the Chinese Academy of Science, Lanzhou, China**

Synthetic chemistry is the central topic of chemical science. It supports every material creation for making a better human life. We will discuss the frontier topics such as C-H bond functionalization, C-C bond activation, C1 Chemistry, and element-organic chemistry, as well as the novel and significant technologies such as enantio-selective catalysis, electroorganic synthesis, nanoscale catalysis, mechanism and process analysis, inorganic synthesis under extreme conditions, living radical polymerization, self-assembly and precision polymer synthesis. The development of efficient and green synthetic methods for materials such as organic electronics, MOF, COF, perovskite solar cells, superconductivity material, biomedical polymer materials, biodegradable plastic, new sustainable plastics and polymer electronic materials will contribute to a bright future. Interdisciplinarity is essential for the future direction, for example, artificial intelligence will be deeply integrated with synthetic chemistry to improve efficiency.

### **2. Future Directions of Catalytic Chemistry**

**Xiaoxin Zou, Jilin University, Changchun, China**

Catalytic chemistry is playing a crucial role in sustainable development since at least one catalytic process is involved in almost all the important areas of chemical industry, such as synthesis of chemicals and materials, energy production and conversion as well as pollution abatement and environmental protection. In this paper, we attempt to summarize some future challenges and opportunities in catalysis, including heterogeneous catalysis, homogeneous catalysis, biocatalysis and photo-/electro-catalysis. We review several common critical directions for catalysis research, in order to meet future needs for sustainability: (i) the discovery of new catalysts evolving from trial-and-error to rational design; (ii) deeply fundamental understanding of catalytic processes, especially in terms of the dynamic nature of catalysts under reaction conditions; (iii) the catalysis for the transition of energy generation from fossil fuel to renewable sources; (iv) the catalysis for cleaner and “greener” chemical processes.

**3. Future Directions of Chemical Theory, Mechanism, and Computation**  
**Yuyuan Lu, Changchun Institute of Applied Chemistry of the Chinese Academy of Sciences, Changchun, China**

Theoretical and computational chemistry applies chemical theory and numerical computation to reveal the nature behind complex chemical phenomena and to make prediction. It has been realized now that the computation, together with theory and experiment, acts as the third pillar of scientific research, enabling scientists to test, discover and build models/theories of corresponding chemical phenomena. Due to the development of high performance computing facility and artificial intelligence, theoretical and computational chemistry enters into a new era. By extracting knowledge from massive chemical data, artificial intelligence approaches have provided environmental-friendly, clean, and efficient solutions to investigate chemical processes. The challenges of chemical theory and computation lie in the transition from order to disorder, from thermodynamics to dynamics, and from equilibrium to non-equilibrium. Despite an increasingly rapid emergence of advances in computational power, detailed criteria for database, effective data sharing strategy and deep learning workflows are still to be developed. We will first outline some challenges and limitations of the current theoretical chemistry, and then we will discuss the trends in artificial intelligence approaches, with an outlook on the potential future directions for chemistry in the big data era.

**4. Future Directions of Material Chemistry and Energy Chemistry**  
**Jing Cao, Lanzhou University, Lanzhou, China**

Energy is the foundation for modern society. The key challenges for energy chemistry are energy utilization efficiency and energy diversifications. Energy chemistry processes mainly include the activation and conversion of energy-carrying molecules, and the transfer and storage of energy-carrying electrons. The emphasis is on the physicochemical process that occurs at the interface of energy materials. Most of these processes occur on nanocrystalline materials, two-dimensional layered materials,

porous materials and so on. The development of the new energy materials is the research focus in the field of material chemistry all the time. To improve the efficiency of existing photovoltaic cells and develop the new light-capture materials and catalysts is one of the most effective approach to increase solar power capacity radically. By reducing the cost of large-scale utilization can the inexhaustible solar energy play a role adequately. To make better use of energy from fossil fuels and biomass, the high-performance catalytic materials are required increasingly. In addition, it is an important research direction of material chemistry and energy chemistry to deeply understand the reaction mechanism of energy conversion and develop new materials and exploiting sustainable energy storage technologies that will meet future demands without increasing harmful emissions of carbon dioxide.

## **5. Future Directions of Chemical Detection and Measurements**

**Zhiyuan Gu, Nanjing Normal University, Nanjing, China**

We summarize here nine aspects of chemical detection and measurement, including bioimaging, in vivo real-time detection, biomolecule recognition and disease therapy, complex samples analysis, biomacromolecule structure and function, rapid chemical and electron transfer processes, single-entity analysis, large-scale scientific instrument and public health screening. We focus both on the heuristic progresses and on the frontiers of chemical detection and measurements essential for chemical sciences. The major challenges are to develop new techniques and analytical methods for the advancement of chemical sciences.

## **6. Future Directions of Chemical Biology**

**Shanshan Lv, Beijing University of Chemical Technology, Beijing, China**

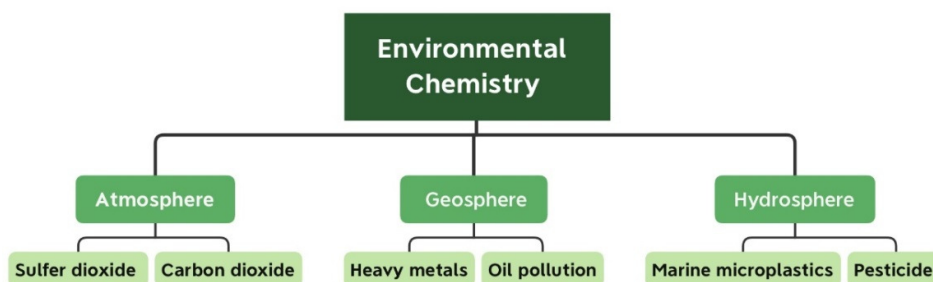
Over the past decade, substantially increasing and ever-growing interests efforts have been devoted to chemical biology, thanks to the development of genome sequencing (revealing potential drug targets), synthetic chemistry (making new medicines) and high-throughput screening technologies (in vitro cell systems, protein binding assays, phenotypic assays, and organism assays). Here, we present the progresses and perspectives on *Chemical Biology* from basic principles, to recent advances and key challenges, and suggestions for future research, with a focus on *Chemical Biology* in the context of human health. *Chemical Biology* provides better understanding of the molecular and cellular mechanisms underlying disease, and develop improved methods for diagnosis, and optimize drug discovery processes and therapeutic delivery approaches for treatment. The pressing challenges lie in selecting appropriate targets in biological systems and adopting more rational design strategies for development of innovative and sustainable diagnostic technologies and medical treatments. Therefore, more than ever, researchers from different disciplines of chemistry, biology, medicine, materials and engineering need to collaborate to address the challenges in *Chemical Biology*.

## **7. Future Directions of Environmental Chemistry**

**Xuefeng Jiang, East China Normal University, Shanghai, China**

Earth's environment is mainly composed of the aerosphere, hydrosphere, pedosphere, lithosphere and biosphere, which constitute a largely interactive system. Once

chemical pollutants enter the environment, they will migrate and transform through the atmosphere, water, soil, rock and organisms, and thus exist in all layers. For example, heavy metal pollutants can be found not only in the hydrosphere, pedosphere and lithosphere, but also in organisms via food chain and air in the form of solid dust. Therefore, it is not reasonable to study a certain pollutant limited to one single layer. Due to the complexity of the earth system, we must divide the environmental chemistry into different parts and select abundant and easy to handle hazardous substances to solve the complex pollution problem efficiently. Since anthropogenic environmental pollution and ecological damage mainly occur in the atmosphere, hydrosphere and pedosphere, environmental chemistry is accordingly divided into atmospheric environmental chemistry, soil environmental chemistry and water environmental chemistry. We will introduce the two prominent problems in each of the three branches, and make an outlook for the future three decades from the perspective of chemistry.



## 8. Future Directions of Industrial Chemistry and Chemical Engineering

### Geng Deng, Tsinghua University, Beijing, China

In recent decades, industrial chemistry and chemical engineering should continuously respond to those questions which closely related to the development of human society and civilization, and also should expand the application area of pure chemistry. The production and manufacturing of chemicals is still the central question, in which novel synthetic pathways, newly developed manufacturing methods and biochemical engineering would play their important roles. Functional nanostructure and membranes as well as other novel materials have demonstrated versatile application under different conditions. Meanwhile, to answer the vital energy and environment problems, advanced energy sources, green catalysis, synthetic biological. Engineering and carbon reproduction and utilization should be constantly focused on. Combination of computation, simulation and experiment, as well as the application of artificial intelligence should be emphasized in further investigation. Demand-driven methodology should be much accounted of weight in future research works.

## Organizational Structure Review Group Report

### Recommendations

The review group has prepared a set of recommendations on the structure and the functions of IUPAC. The organisational structure proposed here delineates clearly distinct areas of responsibility for each governing body so that both governance responsibilities and the scientific work of IUPAC are weighted equally in importance and are overseen by appropriate experts, with oversight by Council. The structure is intended to facilitate decision making, timely scientific contributions, and engagement by all stakeholders. Structural recommendations are made for governance and the Secretariat, and recommendations of a functional nature are proposed for membership relations and for communications with stakeholders and the chemistry community.

### Governance

The review group recommends replacing the current Bureau-Executive Committee structure with two governance Boards that cover administrative matters and the science.

**Executive Board (EB):** This Board is responsible for decisions and execution of the administrative matters of the Union. The EB shall include the 5 Officers of the Union (President, Vice President, Immediate Past President, Secretary General, and Treasurer) plus 6 elected members, of which 5 are nominated by the NAOs and elected by the Council, and one is the Chair of the DP-SCC Board. The Executive Director is an *ex-officio* non-voting member of the EB.

**Division-Standing Committee Board (DP-SCC):** This Board is responsible for the scientific direction, activities, and contributions of the Union. Division Presidents and Standing Committee Chairs are the members of this Board. The Executive Director and Secretary General are *ex-officio* non-voting members of this Committee.

**Council:** Membership and voting procedures of the Council shall be as described in the current Statutes and Bylaws. The Council can meet electronically in “off years” (years in each biennium in which the General Assembly is not scheduled), and the primary biennial Council meeting is held every 2 years, preferably but not necessarily in conjunction with the General Assembly and IUPAC Congress. A face-to-face meeting is preferred for biennial Council meetings but meeting electronically or by hybrid means is also permitted. In addition to governance matters, the Council can discuss one or more emerging issues that affect the Union, particularly scientific matters.

### Science – Divisions and Standing Committees

**Divisions:** The review group recommends maintaining the current overall divisional structure for the time being, but it is also recommended that the Divisions and Standing Committees form a working group to review the Division and Standing Committee structure in the light of current needs and emerging trends in chemistry and propose any changes to the Division and Committee structure as needed for decision and implementation in time for the 2024-2025 biennium.

## Organizational Structure Review Group Report

**Standing Committees:** Three new Standing Committees (Ethics; Diversity, Equity and Inclusion; and History of Chemistry and Archiving) are proposed, following in part on suggestions from the auditors. It is recommended that creation of these Committees be submitted for approval by the 2021 Council so that they can begin their work in the 2022-2023 biennium.

Additionally, modified roles for several existing Standing Committees are recommended. In particular:

- The responsibilities of the Project Committee should include review of completed projects on a regular basis to assure timeliness, effectiveness and compliance with the IUPAC Strategic Plan.
- Responsibilities of the Evaluation Committee should include evaluating the performance of the Divisions and Standing Committees in view of the mission and strategic plan, with a special focus on constructive guidance.
- CHEMRAWN should include a focus on cooperation between IUPAC and international organisations and initiatives such as UNESCO, UN SDGs, etc. to identify critical world needs and recommend involvement by the relevant Divisions and Standing Committees.
- ICGCSD should encourage interdivisional projects in the area of sustainable development.

### The Secretariat

The Secretariat performs indispensable functions for IUPAC, including sound management of the finances of the Union. The following recommendations and suggestions are intended both to enhance the contributions of the Secretariat but also, over time, to decrease costs.

- Evaluate suitability of a virtual or hybrid office model.
- If hybrid/in-person preferred, consider location in order to balance staff retirements, with synergies on costs and staff expertise (within 2-5 years).
- Complete skills assessments for current staff.
- Complete the work to move away from paper to electronic handling of data and materials
- Consider viability of outsourcing certain activities/responsibilities.
- Strengthen expertise at the Secretariat focused on Communications, including web, social media, and public outreach.
- Strengthen expertise at the Secretariat focused on Information Technologies, including virtual meeting technologies; and branding/promotion, including the IUPAC shop.
- Consider utilisation of volunteers or interns to help on administrative tasks that do not require specialist expertise; e.g. *ad hoc* group to organise archival files and similar materials, internship program.
- Complete the work on establishing an Endowment Fund and a mechanism for allowing for charitable donations.
- Assess whether IUPAC should negotiate a fixed amount (as per prior arrangement) from conference organisers for endorsed conferences.

## Organizational Structure Review Group Report

### Communications

Improved communication was one of the most strongly emphasised needs among the responses to the survey.

Two new global Forums are recommended:

- **NAO Forum:** This Forum is a yearly electronic meeting with representatives of each NAO and ANAO to provide an opportunity to interact with leadership, asking questions etc. Topics for discussion may include mutual activities among the NAOs, emerging issues facing the Union, and other similar matters.
- **Presidents Forum:** An annual meeting (online in off-years and in-person in years with GA) with the presidents of all global chemical societies. This is a strategic opportunity, as the chemical societies never meet, besides in regional meetings, as an occasion for IUPAC to exercise its convening role in global chemistry to show leadership and coordination of international initiatives.

### Communication with Stakeholders

- Establish an IUPAC newsletter that is freely distributed to all stakeholders.
- Prepare a biennial report for NAOs and other stakeholders on activities in IUPAC
- Make Chemistry International more widely accessible.
- Develop a process for communication with NAOs that assures the proper person/s are receiving and acknowledging communications from IUPAC.

### Web site

- A short video introduction from the IUPAC President.
- On the contact us page, add a link to the secretariat page.
- Add bullet point descriptions for primary task responsibilities to the secretariat staff biographies.
- Become a hub of information about current topics of interest (SDGs) or rapidly evolving situations (COVID-19).
- Host webinars in collaboration with other international groups i.e. NAOs

### Membership

Following are recommendations and suggestions for enhancement of the experiences of IUPAC volunteers in response to requests and observations in the responses to the survey.

- Create a handbook for volunteers.
- Recognize volunteers' service.
- Establish a database of active volunteers within the Union.
- Overhaul the various individual membership options to consider different membership categories and fees depending on whether you come from industry/academia/student.
- Publicise membership options *and* benefits.

Regarding recommendations for the Secretariat, Communications, and Membership above, the review group acknowledges that there are current activities and initiatives already under way that

## Organizational Structure Review Group Report

are consistent with several of these recommendations. We hope that our recommendations will serve to reinforce these ongoing efforts and to highlight their importance to IUPAC.

The work of the review group and its recommendations are described in detail in the body of this Report.

### II. Introduction and Background

At the IUPAC Council meeting in 2019, Congress voted to establish a working party to “undertake a complete review of the organizational structure of IUPAC,” and that this working party should “develop proposals for the future organization of IUPAC,” for discussion during the 2020-2021 biennium and a vote at the 2021 Council meeting (*Chem. Intl.*, April-June 2020, p. 22). The IUPAC Organizational Structure Review Group was officially established in early 2020 and includes the following members: Dr. Mark C Cesa, (USA, Chair, 2014-2015 President of IUPAC and member of the IUPAC Finance Committee), Prof. Ito Chao (China/Taipei), Prof. Dr. Michael Droescher (Germany), Prof. Lori Ferrins (Australia, IYCN), Prof. Zhigang Shuai (China/Beijing) Prof. Javier Garcia Martinez (Spain, IUPAC Vice President, *ex-officio*). The review group established Terms of Reference and initiated a project to cover its work (<https://www.iupac.org/project/2020-007-1-020>).

The review group has met at regular intervals electronically, and organized its approach along two major lines:

1. Recommending directions for the scientific work of the Union going forward, and how to structure the Union to achieve its scientific objectives;
2. Recommending ways of working that would reduce costs and improve efficiency.

To inform the review group and to aid in making recommendations, the following sources of information were used:

1. A survey of IUPAC stakeholders, including NAOs, AOs, Associated Organizations, Titular Members, Associate Members and National Representatives of Division Committees and Standing Committees, Affiliate Members, and other persons in the global chemistry community. The survey and the responses are included in this report in Appendices I - III. Further discussion of the survey and its results appears in Section III of this report.
2. Interviews with the Executive Director on the composition, tasks and responsibilities of the IUPAC Secretariat. These discussions gave the review group a greater understanding of the contributions, responsibilities and challenges at the Secretariat and provided the basis for recommendations in Section V of this report.
3. A review of emerging trends and advances in the chemical sciences. This work included a summary of top scientific challenges, identified by Prof. Shuai and Prof. Dr. Droescher (Appendix IV), and the IUPAC Top Ten Emerging Chemical

## Organizational Structure Review Group Report

Technologies for 2019 and 2020. Further description of this work appears in Section IV of this report.

4. A review of the organizational structure of several other international scientific unions, via their web sites, to identify possible good practices, which also provided ideas for recommendations in Section V of the report.
5. The prior report by the Finance Committee Options Work Group, and other prior IUPAC initiatives on structural changes.

### III. The Survey

A survey was prepared to assess the thoughts of the wider chemistry community on the impact, scope and activities of IUPAC. The survey was circulated by email to 1724 stakeholders: attendees the IUPAC council meeting in 2019, NAOs, ANAOs, Associated Organizations, Bureau members, Company Associates, Division Committee members, Standing Committee members, project task group chairs and members, and Commission members. By the deadline, 447 respondents from 60 NAOs and other countries had submitted their feedback. Subsequently, NAOs were invited to submit responses to the survey to ensure that their views, in addition to those of individual stakeholders, were considered. The views of the seven NAOs who responded to this request and the individual stakeholders were in general agreement and, as such, have been considered together. The survey, a compilation of survey responses, and a compilation of responses from seven NAOs are included in this report as Appendices I, II and III, respectively. An Excel spreadsheet with the raw data from the survey will be available at the Secretariat.

Responses to the survey included many observations and suggestions for useful and concrete improvements, but they also included some comments that revealed that current processes, Union bodies, or practices were not well known to some respondents. The responses to the survey should be considered carefully in this light.

There was a good consensus that defining nomenclature, terminology and symbols is a uniquely valued ongoing activity that IUPAC performs, and one of the most important contributions to the chemistry community that IUPAC makes. Respondents also believe that IUPAC plays an important role in the identification and sharing of key chemical technologies, building capacity worldwide, providing networking opportunities and catalyzing the formation of interdisciplinary collaborations. Setting and recommending other standards were also seen by many to be another unique feature of the Union. A number of respondents called for IUPAC to increase its collaboration with major scientific organizations, and some acknowledged that the current organizational structure may pose challenges for IUPAC to adapt to the rapidly changing world.

Some respondents expressed concern that the project system as it stands currently may not be maintainable in the long-term because they perceive that there are insufficient funds to cover the vast array of projects. The diverse portfolio of projects is perceived to dilute the scientific impact as seen by the larger chemistry community, and this is further exacerbated by regular turn-over of those in leadership positions, leading to changing priorities. A number of people also commented that the project system does not seem to have enough checks and balances to ensure

## Organizational Structure Review Group Report

timely completion of projects, or meeting the goals that were described in the initial submission (or describe why plans deviated from what was approved). Examination of completed IUPAC projects is needed to determine their value to the scientific community, and is a way to provide a measure of the project system and its effectiveness.

Many respondents appeared to be aware of the financial strain that IUPAC is currently under. Survey respondents had a number of ideas regarding how to decrease the operational costs of IUPAC, and how to go about raising additional revenue. Broadly, the respondents identified several categories of expenses that could be targeted to reduce the operational costs of the Union. Many of these were consistent with other suggestions such as moving towards online meetings, embracing the use of technology, relocation of the secretariat, and changes to the organizational structure and project system. Respondents typically highlighted many of the efforts that the Secretariat and officers are already implementing to increase revenue (endowment fund, the IUPAC shop), though there were also suggestions to expand opportunities to bring back workshop offerings, hiring a marketing manager and expanding/promoting the membership offerings. Some of the suggestions included involving more industrial people in divisions and task forces by taking advantage of personal contacts, and to communicate more with industry about the service and benefits that IUPAC offers to the community and the individual (e.g. the Company Associates program).

Around a third of respondents think the Union should change its organizational structure, while 27% of respondents felt ill-equipped to answer the question. There may be a slight preference among those who have been more involved (at higher levels) with IUPAC that the Union needs to change. The organizational structure of the Union is typically not at the forefront of stakeholders' minds, but it is the assessment of the review group that the structure of the Union needs to change so that the Union will be better able to accommodate the rapidly evolving field of science and to serve the needs of its stakeholders.

In terms of the scientific organization of the Union, there were several recommendations from respondents about which areas are missing from within IUPAC: for example, computational chemistry, materials science, and chemical engineering. Many also felt that IUPAC needs to refocus back to its "core" activities, particularly those that are unique to the Union. While these two ideas may seem contradictory, the review group believes that this is achievable by creating a structure of the Union that takes both core activities and emerging areas of science into account and promotes inter-divisional and -committee interactions.

There were many respondents who indicated that they wanted to see IUPAC embrace information-related technologies such as webinars, online voting, use of artificial intelligence, making color books digitally available, and open publishing. In addition, many people mentioned that IUPAC needs to incorporate IT tools into the scientific work of the Union by looking at digital data standards, artificial intelligence, online streaming (lectures and laboratories), computational chemistry, deep learning, and open data.

Just over half of respondents indicated that IUPAC is somewhat responsive (45%), or not responsive (6%) to the rapidly changing scientific environment. Other organizations have increased their visibility during the pandemic by making use of technology by running webinars and increasing their use of social media to deliver verified information. Further to this, 76% of

## Organizational Structure Review Group Report

respondents felt that IUPAC should be an international hub of chemical information. Through gathering information from NAOs and sharing via the IUPAC website, the Union may improve NAOs' international visibility and relevance, though this may only be achieved through close collaboration with the NAOs and other scientific organizations internationally.

Respondents were asked how IUPAC could better serve its current members and volunteers. The responses broadly fell into the following categories:

- Engagement/Assistance/Activities - provide/organize workshops, meetings, conferences, etc.; invite volunteers to Division and Standing Committee meetings (including provision of travel support); increase number of volunteers from developing countries; greater involvement in science policy development
- Information/Communication - create an historical archive of IUPAC activities; send newsletters; create awareness of activities amongst the NAOs and the broader scientific community
- Recognition - provide certificates for service; provide support to enable their participation in Union activities (including funding to attend meetings)

Overall, there were several common trends amongst the responses:

- 1) IUPAC needs to be more responsive, adjusting priorities in response to the rapidly changing scientific environment and culture;
- 2) remain focused in the core activities of IUPAC but include an emphasis on emerging areas in the chemical sciences;
- 3) embrace technology in the day-to-day operation of the Union;
- 4) promote social equity and diversity in the chemistry community (this also needs to be reflected in the structure of the Union as a whole). There was an emphasis in the respondents' comments about having a formal younger chemists' program;
- 5) increase the visibility of the Union such that we can recruit top chemists to contribute to the activities of the Union;
- 6) be more communicative - this applies to all facets of IUPAC's business; increasing communication with NAOs, Associate Organizations, and members.

### IV. Emerging Trends in the Chemical Sciences

Research in the chemical sciences is rapidly growing and changing as it incorporates interdisciplinary knowledge and as chemists collaborate with experts in other scientific and engineering fields. Prof. Shuai recruited several younger colleagues to identify newly emerging areas of scientific research in the chemical sciences. Each of Prof. Shuai's colleagues prepared a summary of new directions in synthetic chemistry; catalytic chemistry; chemical theory, mechanism and computation; materials chemistry and energy chemistry; chemical detection and measurements; chemical biology; environmental chemistry; and industrial chemistry and chemical engineering. The topics span the traditional fields of physical, inorganic, organic, analytical and polymer chemistry, and research in these topical areas draw on knowledge from related fields. These summaries are found in Appendix IV of this report.

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Additionally, the 2019 and 2020 Top Ten Chemical Technologies similarly illustrate the application of interdisciplinary approaches to solving important world problems. See (<https://iupac.org/iupac-announces-the-2020-top-ten-emerging-technologies-in-chemistry/>; *Chem Int*, 41(2), pp. 12-17, 2019; <https://doi.org/10.1515/ci-2019-0203>; and *Chem Int*, 40(4), pp. 14-17, 2018; <https://doi.org/10.1515/ci-2018-0405>).

A special topics issue of *Pure and Applied Chemistry* is in preparation on emerging issues in chemical sciences and technologies.

Finally, responses to the review group's survey suggested a range of topics that respondents believed could be incorporated into IUPAC's scientific work. They included: informatics, computational chemistry, catalysis, digital chemistry and digital tools, systems thinking, two-dimensional soft nanomaterials, meso-entropic matter, carbon chemistry, chemical engineering, materials chemistry, and chemical biology (Note that some of these topics are currently part of IUPAC's work.). Additionally, topics including societal issues and industry and in chemistry, interdisciplinarity, chemistry education, ethics, and improved communications were mentioned.

### V. Recommendations

Organisations need agile and effective structures able to adapt and react rapidly to change. The organisational structure proposed here delineates clearly distinct areas of responsibility for each governing body so that both governance responsibilities and the scientific work of IUPAC are overseen by appropriate experts, with oversight by NAOs and Council. The structure is intended to facilitate decision making, timely scientific contributions, and engagement by all stakeholders. Structural recommendations are made for governance and the Secretariat, and recommendations of a functional nature are proposed for membership relations and for communications with stakeholders and the chemistry community.

#### 1. Governance

The review group recommends replacing the current Bureau-Executive Committee structure with two governance Boards that cover administrative matters and the science. The proposed governance structure includes three governing bodies that delineate distinct areas of responsibility for administration; scientific work; and NAO decisions, information, and approval. The structure is intended to facilitate decision making, timely scientific contributions, and engagement by all IUPAC leaders and stakeholders. It is recommended that the new proposed governance structure should be submitted for approval at the 2021 Council for implementation in the 2024/2025 biennium. Detailed recommendations are described below.

- a. **Executive Board (EB):** This Board is responsible for decisions and execution of the administrative matters of the Union. The EB shall include the 5 Officers of the Union (President, Vice President, Immediate Past President, Secretary General, and Treasurer) plus 6 elected members, of which 5 are nominated by the NAOs and elected by the Council, and one is the Chair of the DP-SCC Board. The Executive Director is an *ex-officio* non-voting member of the EB.

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The period of service of an Elected Member should be two years, and Elected Members would be eligible for re-election to the same office for one more period of two years. Terms of office should be arranged to ensure continuity. All aspects of diversity among EB Elected Members should be considered in the selection process.

Each Elected Member should chair or be a member of a governance committee, so that no elected member should be without a special task and responsibility.

The duties of the Executive Board include administrative matters and governance issues. The EB oversees the organisational structure of the Union, and otherwise carries out the duties currently specified for the Bureau in Statute 7.4. The EB meets in-person, virtually, or a hybrid of these on a regular basis; a meeting every 2 - 3 months is suggested.

- b. Division-Standing Committee Board (DP-SCC):** This Board is responsible for the scientific direction, activities, and contributions of the Union. Division Presidents and Standing Committee Chairs are the members of this Board. The Executive Director and Secretary General are *ex-officio* non-voting members of this Committee.

The DP-SCC meets in person, virtually or hybrid on a regular basis (every 3 months is suggested) to review their project portfolios, collaborations within and outside the Union, scientific conferences in the areas of interest to the Divisions and Standing Committees, and relevant emerging areas in the chemical sciences. The Committee meets with the EB every 6 months electronically to discuss the project portfolio and cooperation/collaboration activities. The DP-SCC may make recommendations on scientific matters for consideration at Council.

- c. Council:** Membership and voting procedures of the Council are as described in the current Statutes and Bylaws. The Council meets electronically in “off years” (years in each biennium in which the General Assembly is not scheduled), and the primary biennial Council meeting is held every 2 years, preferably but not necessarily in conjunction with the General Assembly and IUPAC Congress. A face-to-face meeting is preferred for biennial Council meetings but meeting electronically or by hybrid means is also permitted. Council deals with governance matters including, but not restricted to, voting on EB and DP-SCC elections, financial plans, IUPAC structural issues, and the Statutes and Bylaws. It is recommended that provision be made at Council for discussion of one or more emerging issues that affect the Union, particularly scientific matters. Council meetings are chaired by the President of the Union and are attended by the Executive Director and members of the EB and DP-SCC.

## 2. Science

- a. Divisional and Standing Committee Structure:** The review group recommends maintaining the current overall divisional structure for the time being. However, it is recommended that the Divisions and Standing Committees form a working group to review the Division and Standing Committee structure in the light of the current state and future expectations of the field of the chemical sciences and recommend changes

## Organizational Structure Review Group Report

to the structure as needed. This activity should be completed in the 2022-2023 biennium so that changes can be implemented in time for the 2024-2025 biennium.

### Divisions

From the responses to the survey and examination of emerging areas in the chemical sciences (Section IV), the review group believes that IUPAC can best carry out its work through a combination of deep strengths in the major fields of chemistry (physical and biophysical, inorganic, organic and biomolecular, analytical and polymer, as reflected in these current Divisions), and applying these strengths to emerging issues and areas of continuing need (environment, medicine, etc.) Our recommendations and suggestions for the Divisions are based on IUPAC strategic core values, including scientific excellence, collaboration, diversity and highest standards of transparent, responsible and ethical behaviour, and on top technologies of today and the forecast for how chemistry will develop in the next decade.

It is recommended that the Divisions and Standing Committees form a working group to review the Division and Standing Committee structure in the light of current needs and emerging trends in chemistry and propose any changes to the Division and Committee structure as needed.

This work should adhere to the IUPAC Strategic Plan mission, goals and core values, and it is suggested to focus on the following areas:

- Recognise new developments and their fields of application, especially towards the principal topics in chemistry, and promote future oriented activities for the needs of the world community.
- Be committed to utilising the talents of chemists from around the world in these activities and promoting diversity in division membership. Encourage the compilation and documentation of critically evaluated data and formulate recommendations on terminology, symbols, units and conventions, disseminate the recommendations, encourage their translation as well as monitor their acceptance by the chemical community.
- Promote science and technology at the international level, including education, conferences, policy, and the assessment of societal impact. Facilitate international scientific exchange and cooperate with other international organisations.
- Also, for all divisions, digitization and sustainability should be prime concerns. IUPAC also needs to increase the contribution of chemical engineering and industrial chemistry across the divisional structure.

In the following sections, comments about emerging and possibly underrepresented areas of the chemical sciences that are relevant to each Division are made for consideration by the Division Committees. Regarding future activities, we propose that the DP-SCC may wish to discuss and act according to the following recommendations:

## Organizational Structure Review Group Report

### 1. Pure Chemistry

#### 1. Physical and Biophysical Chemistry

Physical chemistry has links to all other chemical fields, especially to catalysis, theoretical chemistry, most analytical tools, materials, interfaces, polymers, even synthesis. Biophysical chemistry overlaps with biochemistry. Cooperation with other Divisions on projects is strongly advised. Principal topics for projects include catalysis, interface chemistry, electrochemistry, photochemistry, and energy chemistry, especially artificial photosynthesis based on nanostructured and bio-inspired and photonic materials. Special consideration should be given to artificial intelligence and theoretical and computational chemistry.

#### 2. Inorganic Chemistry

Catalysis, solid state, and material science are within the focus of this Division, along with nuclear and radiochemistry. Principal topics for projects include synthesis, catalysis, materials chemistry, especially for energy storing and high-pressure chemistry. Special efforts should be on chemistry at nanoscale, including synthesis, characterisation, and functional investigations of nanomaterials.

#### 3. Organic and Biomolecular Chemistry

Principal topics are synthesis, catalysis, especially enantioselective catalysis, chemical theory and mechanism, chemical biology and organic materials chemistry, detection and measurements, environmental chemistry, industrial chemistry, and scarce element replacements. Technologies including flow chemistry, 3D-bioprinting and chemical discovery by use of artificial intelligence are developing fast and should be a focus.

#### 4. Polymer Division

Activities include synthesis, properties and uses of polymer materials, surfaces, and coatings. Principal topics are synthesis, catalysis, materials, 3D-printing, industrial chemistry, chemical engineering and environmental chemistry, especially in biopolymers and recycling of polymers. Special efforts should be on opto-electronics and membrane involved organic and polymeric materials as applied to information electronics and energy conversion and storage.

#### 5. Analytical Chemistry Division

Analytical chemistry has links into all other fields of chemistry and overlaps with physical methods, as e.g. spectroscopy at all wavelengths. Top topics are bio-imaging, biomolecule recognition, chemical detection and measurements, e.g. nano-sensors and apparatus miniaturisation.

### 2. Applied Chemistry

#### 6. Chemistry and the Environment Division

Here, we advise to reduce complexity. Top topics in view of the Global Sustainable Development Goals are clean water, clean energy, CO<sub>2</sub> sequestration, biodegradability, responsible production, climate action and clean oceans.

## Organizational Structure Review Group Report

### 7. Chemistry and Human Health Division

Top topics are diagnostics, green and inexpensive synthesis of pharmaceutically active molecules, including natural substance and vaccines, unravelling molecular mechanism of immune systems, development of novel tools for monitoring life processes, including biomarkers, molecular imaging techniques and single molecule spectroscopy, cheaper and faster gene sequencing tools and environmental chemistry, especially measurements.

### 8. Chemical Nomenclature and Structure Representation Division

This is clearly a principal activity of IUPAC. Digitisation and the use of artificial intelligence are key success factors for the future, because a common chemical language and nomenclature is the base for the development of new technologies.

## Standing Committees

Three new Standing Committees (Ethics, Diversity, Equity and Inclusion, and History of Chemistry and Archiving – see below) are proposed, and it is recommended that creation of these Committees be submitted for approval by the 2021 Council so that they can begin their work in the 2022-2023 biennium. Additionally, modified roles for several existing Standing Committees are recommended.

### 1. Committees with respect to governance operations

#### Committee on Ethics (Ethics) - NEW

This new committee will establish whistle-blower and harassment policies for IUPAC and prepare recommendations or guidelines for the chemistry community on publishing, sharing chemistry research, and workplace issues. The committee will ensure that all IUPAC sponsored/endorsed/organised events and activities comply with these guidelines and provide a recommendation on withdrawal of endorsement when the guidelines are not met. This committee will be chaired by an Elected Member of the EB. Members will include but not be restricted to at least one Division President or designate and one Standing Committee chair or designate. The Vice President will also serve on this committee.

#### Committee on Diversity, Equity and Inclusion (CDEI) - NEW

This new committee will establish the guidelines of the Union regarding how to promote inclusiveness within our organization and within the wider chemistry community. Such metrics of diversity may include, but are not limited to gender, age, and regional representation. The Committee will ensure that all IUPAC sponsored/endorsed/organised events and activities comply with these guidelines and provide a recommendation on withdrawal of sponsorship/endorsement when the guidelines are not met. The committee will be chaired by an Elected Member of the EB. Members will include but not be restricted to at least one Division President or designate and one Standing Committee chair or designate. The Vice President will also serve on this committee. The Executive Director or designate will be an *ex-officio* voting member of this committee.

#### Committee on History of IUPAC and Archiving (CHCA) - NEW

## Organizational Structure Review Group Report

This committee will develop policies and processes to archive, study, and share all the rich legacy of the Union and communicate the historical and ongoing role of IUPAC in the creation of the common language of chemistry, in the establishment of a set of recommendations and critically evaluated measurements, and in contributing to the chemistry enterprise. This committee will also be responsible for collecting, archiving, and making available the materials produced by the Divisions, other committees, and the governing bodies of the Union. Another goal of this committee will be the promotion of the history of chemistry as a discipline and as a key tool to understand how chemistry has evolved to where it is today. This committee will be chaired by a member of the EB. Members will include but not be restricted to at least one Division President or designate and one Standing Committee chair or designate. The Executive Director or designate will also serve on this committee as ex officio.

### Finance Committee (FC)

Responsibilities and composition follow current Composition and Terms of Reference.

### Project Committee (PC)

Composition of the Project Committee is as per the current Composition and Terms of Reference. The responsibilities of the PC include those outlined in its current Terms of Reference. Additionally, the PC should review completed projects on a regular basis to assure timeliness, effectiveness and compliance with the IUPAC Strategic Plan.

### Evaluation Committee (EvC)

Composition of the EvC is as per the current Composition and Terms of Reference. Responsibilities of the EvC include evaluating the performance of the Divisions and Standing Committees in view of the mission and strategic plan, with a special focus on constructive guidance. The EvC may choose to give advice to the Council as to whether a Division or Standing Committee should continue.

### Membership Relations Committee (MRC)

Composition of the MRC is as per the current Composition and Terms of Reference. The committee is primarily responsible for retention of current NAOs and recruitment of new NAOs.

### IUPAC-Solvay Award Committee (Solvay)

Composition of the EvC is as per the current Composition and Terms of Reference.

## **2. Committees with respect to publishing and nomenclature activities**

### Pure and Applied Chemistry Editorial Advisory Board

Responsibilities and composition follow current Composition and Terms of Reference.

### Chemistry International Editorial Board

Responsibilities and composition follow current Composition and Terms of Reference. An Elected Member of the EB is included in the membership of this Committee.

## Organizational Structure Review Group Report

### Committee on Publications and Cheminformatics Data Standards (CPCDS)

Responsibilities and composition follow current Composition and Terms of Reference. An Elected Member of the EB is included in the membership of this Committee.

### Interdivisional Committee on Terminology, Nomenclature and Symbols (ICTNS)

Responsibilities and composition follow current Composition and Terms of Reference. A member of the EB is included in the membership of this Committee.

## **3. Committees with specific fields of activity within the chemical sciences**

### Committee on Chemistry and Industry (COCI)

Responsibilities and composition follow current Composition and Terms of Reference. COCI should be encouraged to build greater involvement from industry, including but not restricted to large national and global commodity and specialty chemical companies, pharma, and small and medium-sized chemical businesses. COCI should be encouraged to develop affiliations with regional and global chemical industry bodies such as, for example, ICCA, CEFIC, American Chemistry Council, etc., and thus can be a lever for sponsorship income through the new Company Associates Program.

### Committee on Chemistry Education (CCE)

Responsibilities and composition follow current Composition and Terms of Reference. This committee can be the platform for webinars and other applications of social media to education and outreach activities.

### Committee on Chemical Research Applied to World Needs (CHEMRAWN)

Composition of the Committee follows current Composition and Terms of Reference. This committee should include a focus on cooperation between IUPAC and international organisations and initiatives such as UNESCO, UN SDGs, etc. to identify critical world needs and recommend involvement by the relevant Divisions and Standing Committees.

### Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD)

Responsibilities and composition follow current Composition and Terms of Reference. Each division should be active in the field. This committee is primarily tasked with encouraging interdivisional projects.

## **d. Other Governance recommendations**

1. Explore mechanisms to enable participation of new and potential NAOs from disadvantaged countries to become NAOs (by end 2022). This work would fall naturally within the scope of the Membership Relations Committee.
2. Increase engagement with non-IUPAC chemical societies, academies of science, and other similar organisations by, for example, inviting representatives to attend the GA as an observer (by end 2026).

## **3. The Secretariat and Finances**

## Organizational Structure Review Group Report

The Secretariat performs indispensable functions for IUPAC, including sound management of the finances of the Union. The following recommendations and suggestions are intended both to enhance the contributions of the Secretariat but also, over time, to decrease costs.

### a. Secretariat Location

1. Evaluate suitability of a virtual or hybrid office model (by end 2022).
2. If hybrid/in-person preferred, consider location in order to balance staff retirements, with synergies on costs and staff expertise (within 2-5 years).

### b. Secretariat staff and functions; financial matters

1. Complete skills assessments for current staff and map to the tasks that the Secretariat are currently required to take on (by end 2021).
2. Complete the work to move away from paper to electronic handling of data and materials (by end 2021).
3. Consider viability of outsourcing activities/responsibilities of the secretariat; i.e. day-to-day financial handling, communications, marketing etc. (by end of 2022).
4. Strengthen expertise at the Secretariat focused on Communications, including web, social media, and public outreach (by end 2022).
5. Strengthen expertise at the Secretariat focused on Information Technologies, including virtual meeting technologies; and branding/promotion, including the IUPAC shop (by end 2022).
6. Consider utilisation of volunteers or interns to help on administrative tasks that do not require specialist expertise; e.g. *ad hoc* group to organise archival files and similar materials, internship program (by end 2021).
7. Complete the work on establishing an Endowment Fund and a mechanism for allowing for charitable donations (ongoing).
8. Assess whether IUPAC should negotiate a fixed amount (as per prior arrangement) from conference organisers for endorsed conferences, with funds to be used to support travel/attendance of chemists from developing countries.

## Organizational Structure Review Group Report

### 4. Communication

The theme of improved communications was one of the most strongly emphasised among the responses to the survey. Listed here are recommendations and suggestions to address respondent's requests and concerns.

#### a. Communication of IUPAC achievements

1. Establish an IUPAC newsletter (quarterly or semi-annual basis) that is freely distributed to all stakeholders (members, NAOs, chemical societies etc), to inform them about projects, activities, initiatives, awards and news. Seek contributions from NAOs for inclusion also (by end 2021).
2. Establish an biennial report/summary document containing reports from divisions and committees, project updates, online content (e.g. Periodic Table Challenge) (by end 2021).
3. Make *Chemistry International* more widely accessible (by end 2021).

#### b. Strengthening the communicative power of the website

1. A short video introduction from the IUPAC President (plus answers to the commonly asked questions) of IUPAC may be beneficial, particularly for those people who have English as a second language (by end 2021).
2. On the contact us page, add a link to the secretariat page (by end 2021).
3. Add bullet point descriptions for primary task responsibilities (i.e. publications, finance) to the secretariat staff biographies (by end 2021).
4. Become a hub of information about current topics of interest (SDGs) or rapidly evolving situations (COVID-19).

#### c. Create a platform to facilitate the sharing of information

1. NAO Forum: This Forum is a yearly electronic meeting with representatives of each NAO and ANAO and would provide the NAOs with an opportunity to interact with leadership, asking questions etc. Reports may be made by the Executive Board and the Division-Standing Committee Board at the NAO Forum on decisions and activities of the Executive Board and Division-Standing Committee Board; the activities of the Secretariat, including budgets and expenditures; and proposals that may be made from time to time for consideration at Council. Topics may include mutual activities among the NAOs, emerging issues facing the Union, and other similar matters. Meetings of the NAO Forum are chaired by the President of

## Organizational Structure Review Group Report

IUPAC. The Executive Director is an *ex-officio* non-voting member of the NAO Forum.

2. Presidents Forum: An annual meeting (online in off-years and in-person in years with GA) with the presidents of all chemical societies. This is a strategic opportunity, as the chemical societies never meet, besides in regional meetings, as an occasion for IUPAC to exercise its convening role in global chemistry to show leadership and coordination of international initiatives. There should be a theme (e.g. international years, global activities...) with a deliverable.
3. Host webinars in collaboration with other international groups i.e. NAOs.
4. Develop a process for communication with NAOs that assures the proper person/s are receiving and acknowledging communications from IUPAC (by end 2021).

### 5. Membership

Following are recommendations and suggestions for enhancement of the experiences of IUPAC volunteers as they work on Division Committees, Standing Committees, project task groups, and similar activities. Many of these are in response to requests and observations in the responses to the survey.

- a. **Create a handbook for volunteers.** Items that could be included:
- b.
  1. Highlight responsibilities of a member (could also look at differences in roles between titular member etc).
  2. Letter from the IUPAC president welcoming the volunteer and thanking them for their service.
  3. Summarise the benefits of being an IUPAC member.
  4. Explain the project system – how to apply, decision process, joining existing project; to increase engagement and involvement.
  5. Directory of important people to contact (division chairs, elected officials).
  6. Summarize who to reach out to in the Secretariat office for specific purposes i.e. financial matters.
  7. Statutes and bylaws.
  8. Highlight processes to claim re-imbursements.

## Organizational Structure Review Group Report

- c. **Recognition of volunteers' service:** Establish a program to provide certificates (or some other mechanism) to acknowledge completion of projects, service on a Division Committee or Standing Committee or ad-hoc working group, and other volunteer service (by end 2022).
- d. **Establish a database of active volunteers within the Union.**
  - 1. Secretariat to encourage people to give IUPAC permission to share their email/name/details with a closed group of people i.e. other IUPAC volunteers actively contributing to divisions/projects to facilitate networking and cross-collaborations.
  - 2. Use this, or the current website to also capture historical information (how have people otherwise been involved with IUPAC?)
- e. **Overhaul the various individual membership options**
  - 1. Establish a task group to consider different membership categories depending on whether you come from industry/academia/student. Potentially simplifies the marketing that is required and (if students are free/significantly cheaper) may attract them to be engaged with the Union early.
  - 2. Assess whether the fees need to consider geographical location of the applicant.
  - 3. Develop a marketing campaign to promote membership options *and* benefits.

Regarding recommendations for the Secretariat, Communications, and Membership above, the review group acknowledges that there are current activities and initiatives already under way that are consistent with several of these recommendations. We hope that our recommendations will serve to reinforce these ongoing efforts and to highlight their importance to IUPAC.

## VI. Acknowledgments

The Organizational Structure Review Group acknowledges the persons and NAOs who responded to the survey, and all others who provided information, for their thoughtful and insightful comments and suggestions. The review group looks forward to discussions with the Executive Committee.

## **Organizational Structure Review Group Report**

### **VII. Appendices**

Appendices will appear in a Dropbox location for access by Executive Committee members.

APPENDIX I. Survey Questions

APPENDIX II. Survey Summary  
[Responses Submitted via Cognito Forms]

APPENDIX III. Survey Summary  
[Responses Submitted Directly from NAOs]

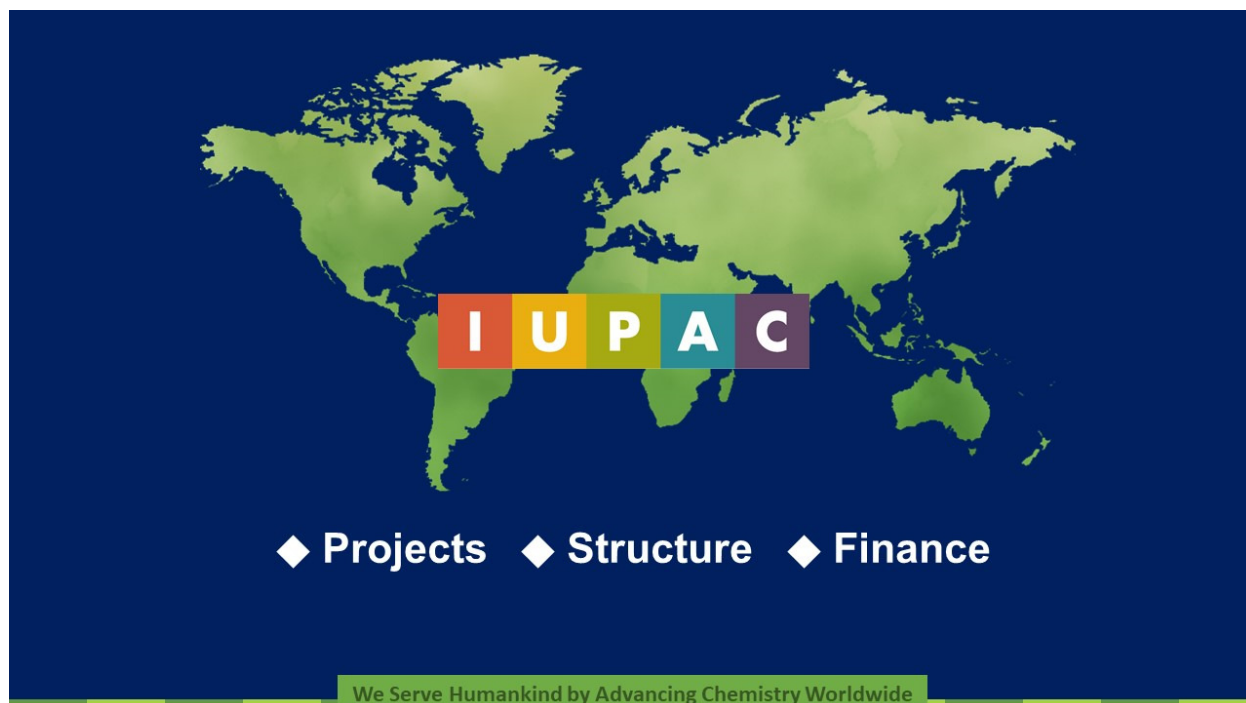
APPENDIX IV. Abstracts of Papers from Colleagues of Prof. Zhigang Shuai on Emerging Areas in the Chemical Sciences

Respectfully submitted,

Mark Cesa  
Ito Chao  
Michael Droescher  
Lori Ferrins  
Javier Garcia Martinez  
Zhigang Shuai

# IUPAC Organizational Structure Review Group

## APPENDIX I. SURVEY







**Vision**  
An indispensable worldwide resource for chemistry



**Mission**  
Provides objective scientific expertise and develops the essential tools for the application and communication of chemical knowledge for the benefit of humankind and the world.



**Values**  
Scientific excellence, communication, transparency, diversity, and ethical behavior

We Serve Humankind by Advancing Chemistry Worldwide

## Introduction

---

Since 1919, IUPAC has been creating a common language for chemistry through international collaboration. Its visionary endeavors and free exchange of scientific information have laid the foundation for the modern advancement of science and technology. Today, humankind faces pressing challenges; global sustainability and inter- and transdisciplinary collaboration have never been as important as they are now. Chemistry is a main driver of scientific progress, and it needs to respond to the needs of a changing world.

IUPAC needs the collective wisdom of all of its stakeholders to imagine whether, and how, IUPAC should evolve in order to carry out its tasks most efficiently. Your input, together with the thoughts and ideas of other stakeholders, will help guide recommendations for the timely evolution of IUPAC and enable its future contributions to the betterment of humankind.

---

Responses are required for the starred (\*) questions

Note: you can save your progress at any time and return to complete this form, simply scroll to the bottom of the form and select "Save", an email will be sent to you with a link to your partially completed responses.

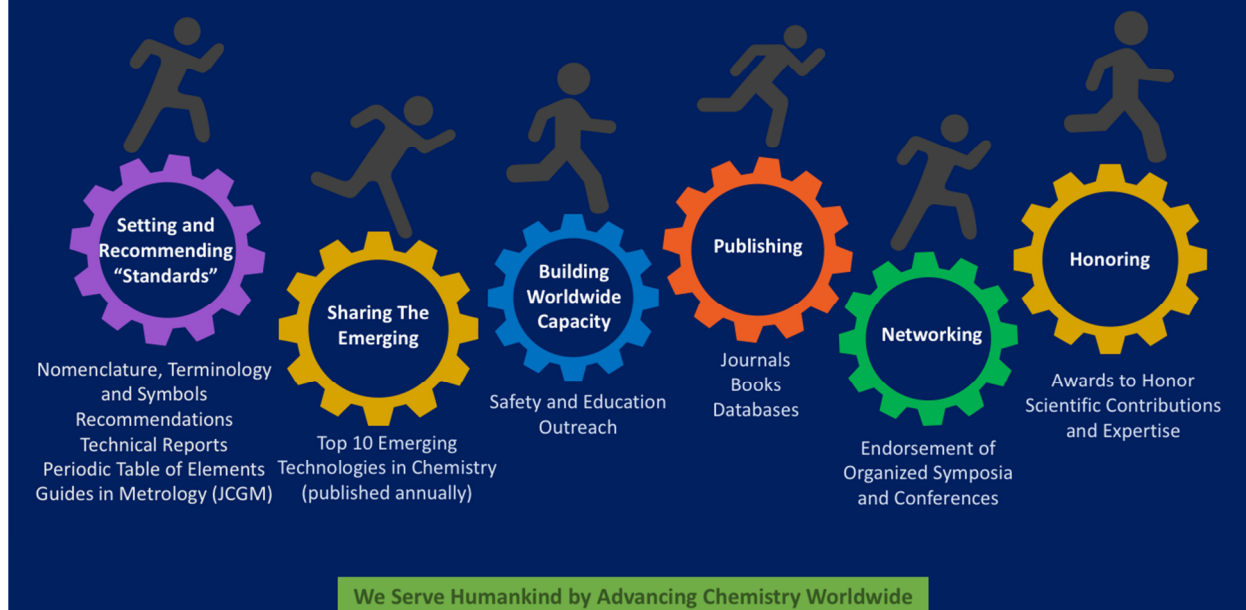
## Your Background

On behalf of which NAO are you completing this form? \_\_\_\_\_

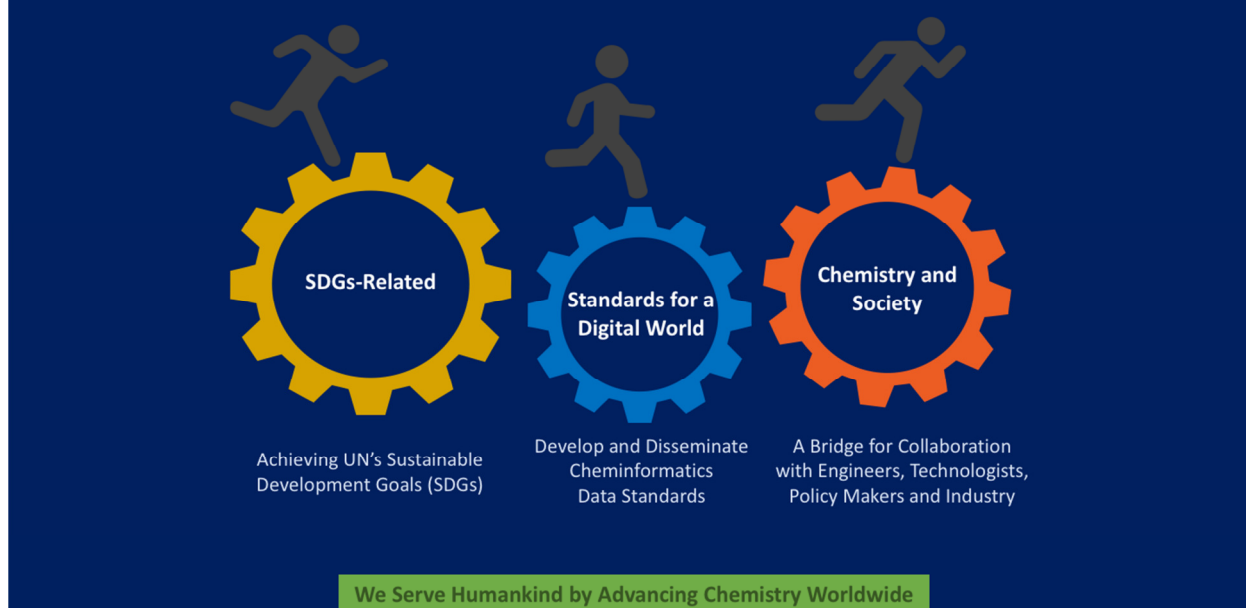
## IUPAC Scientific Activities

**Please browse through the following slides about IUPAC's scientific activities**

## Some Current IUPAC Scientific Activities



## Emerging Emphases



Want to learn more? Click on the following Links:

1. **Setting/recommending "standards":** Nomenclature; Recommendations; Technical Reports; Periodic Table of Elements; Guides in Metrology (JCGM)
2. **Highlighting the Top Ten Emerging Technologies in Chemistry**
3. **Building worldwide capacity (Safety and Education outreach)**
4. **Publishing:** Journals; Books; Databases
5. **Networking:** Conferences

6. **Honoring: Awards**

**a. Current Status**

**1. In your view what is the importance of the various activities undertaken by IUPAC?**

i) Setting/recommending standards	Very important	Quite important	Important	Somewhat important	Not important
ii) Identifying and sharing key chemical technologies	Very important	Quite important	Important	Somewhat important	Not important
iii) Capacity building worldwide	Very important	Quite important	Important	Somewhat important	Not important
iv) Publishing	Very important	Quite important	Important	Somewhat important	Not important
v) Networking	Very important	Quite important	Important	Somewhat important	Not important
vi) Honoring	Very important	Quite important	Important	Somewhat important	Not important
vii) Other	Very important	Quite important	Important	Somewhat important	Not important

**If you answered Other above, please describe** \_\_\_\_\_

**2. For each activity below, to what extent is IUPAC's work unique or distinctive with regards to other chemistry-based organisations or similar scientific organisations?**

i) Setting/recommending - Nomenclature/terminology/symbols	low	medium	high
ii) Setting/recommending - Other standards	low	medium	high
iii) Identifying and sharing key chemical technologies	low	medium	high

iv) Capacity building worldwide	low	medium	high
v) Publishing - Books	low	medium	high
vi) Publishing - Journals	low	medium	high
vii) Publishing - Databases	low	medium	high
viii) Networking	low	medium	high
ix) Honoring	low	medium	high
x) Other	low	medium	high

**If you answered Other above, please describe** \_\_\_\_\_

**Comments**

\_\_\_\_\_

**3. What benefits do you receive from IUPAC's activities?**

\_\_\_\_\_

**4. When you review the range of activities undertaken by IUPAC today, and the resources IUPAC has, do you feel that:**

- i) There are important gaps
- ii) IUPAC has it about right
- iii) IUPAC is spread too thinly and under-resources important activities

**Please explain your selection(s) above**

\_\_\_\_\_

**b. Looking to the Future**

**5. Do you feel the most valued and distinctive activities for IUPAC will significantly change in the next decade? Please explain your choice below.**

Yes

No

**5i) To what extent and in what ways?**

---

**5ii) In what areas should IUPAC be focusing in the future and why?**

---

**6a) How can IUPAC adapt to the evolving needs of the chemistry and chemical engineering community?**

---

**6b) How can IUPAC reach out to new beneficiaries? And who might they be?**

---

**6c) How might IUPAC better reach and engage with chemical organizations and societies?**

---

**7. Which areas of chemistry or chemical engineering are not currently reflected within IUPACs structure?**

---

**8. How responsive to the changing world do you find IUPAC today?**

Not responsive

Somewhat responsive

Responsive

Highly responsive

**9. Some National Adhering Organizations (NAOs) have information of global importance (e.g. information relevant to Covid-19 or climate change)**

**i) Do you think IUPAC should be a hub for sharing information from global chemical societies?**

Yes

No

**ii) If you represent an NAO, will your NAO or national chemical society be willing to notify IUPAC and let it broadcast your webpage or social media content?**

Yes

No

**If you answered Yes above, what is your NAO?**

---

**10. IUPAC wants to strengthen its links into chemical industry**

**i) How beneficial is to industry working with IUPAC?**

Very beneficial

Somewhat beneficial

Neutral

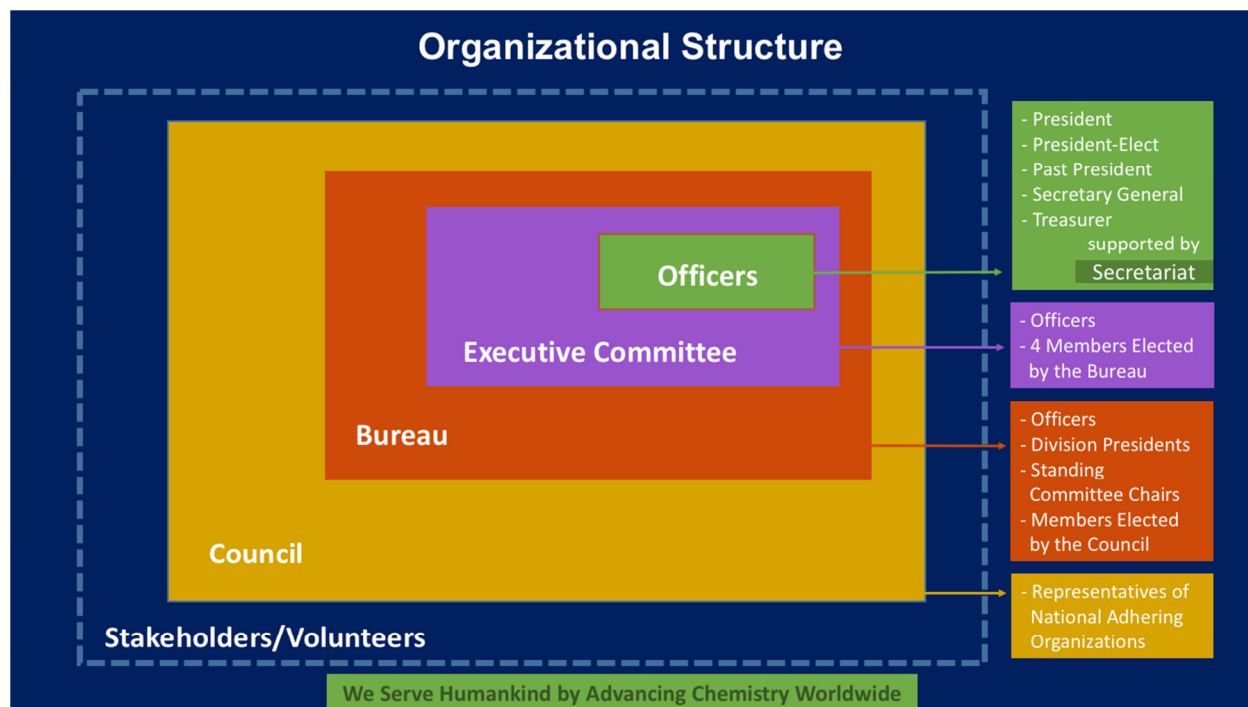
Not beneficial

**ii) What should IUPAC do to improve its links to industry?**

---

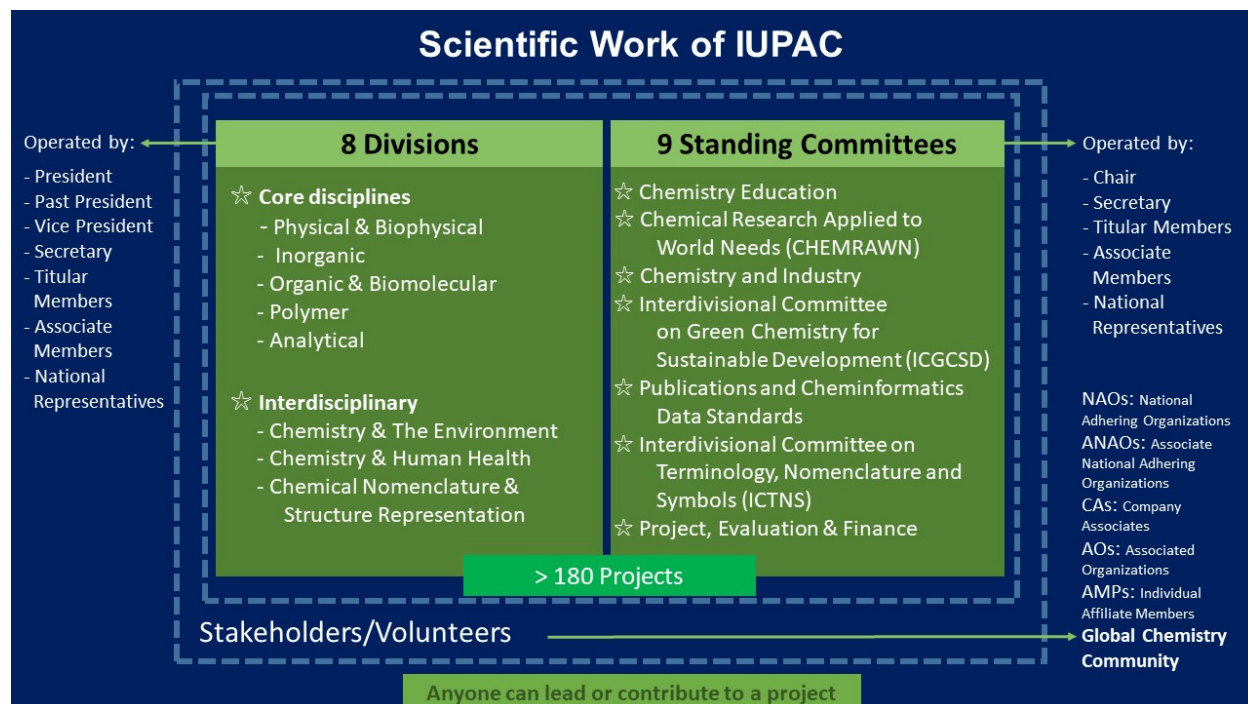
## **IUPAC Structure and Finance**

**Please browse through the following slides about IUPAC's Structure and Finance**

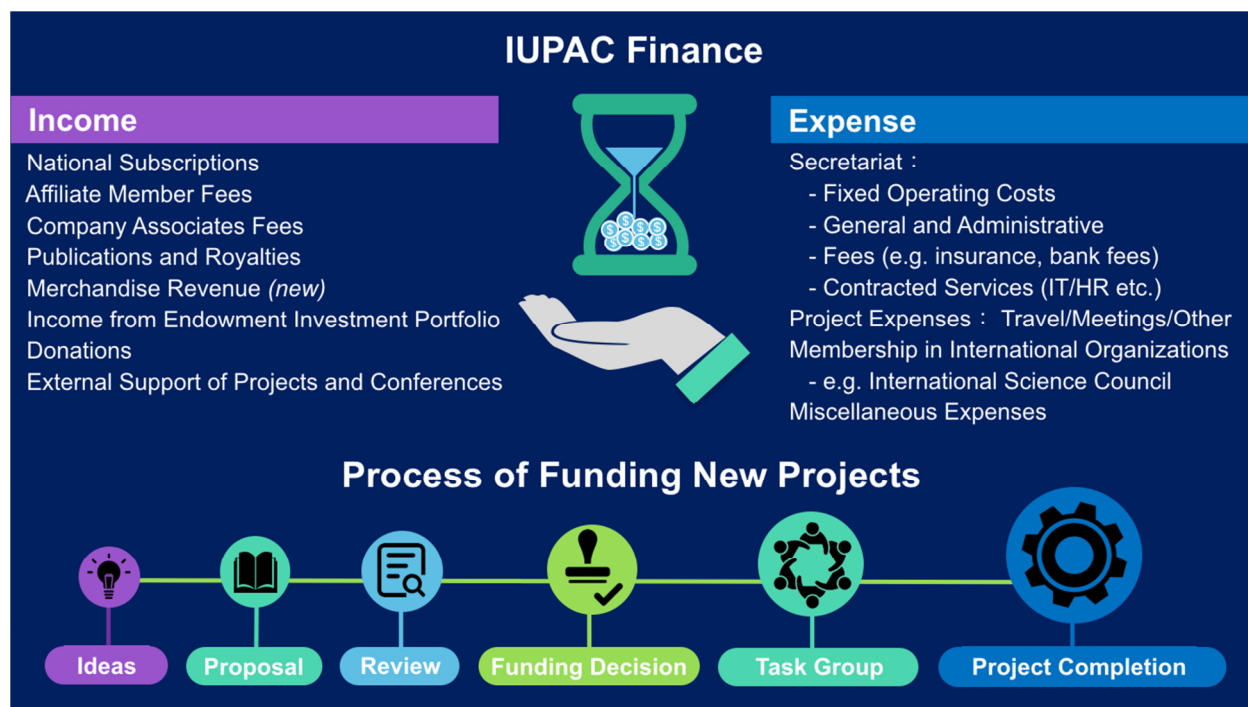


1. **Current global members: More than 50 National Adhering Organizations (NAOs)**
2. **Want to learn more? Click on the following links.**
3. **Officers ; Executive Committee ; Bureau ; Council ;**
4. **Secretariat: Executive Director plus 4 staff members**

**Stakeholders:** National Adhering Organizations (NAO), Associate National Adhering Organizations (ANAO); Company Associates (CA); Associated Organizations (AO); Affiliated Members(individual members (AMP)



Want to learn more? Click on the following links [Divisions](#), [Standing Committees](#)



Want to learn more? Click on the link [Projects](#)

11. In what ways could IUPAC serve its current members and volunteers better and more effectively?

**Associated/National Adhering Organizations:**

---

**Company Associates:**

---

**Associated Organizations:**

---

**Affiliate Members:**

---

**Volunteers:**

---

**Other:**

---

**12. What is your opinion of the structure of IUPAC?**

- i) The current organization provides the foundation for us to adapt for the future
- ii) The current organization is overly complex and won't be able to adapt quickly
- iii) The current organization does not cover certain important topics:

**If you answered the organization does not cover certain important topics, please list here**

---

**13. Does IUPAC need to change its organizational structure?**

Yes

No

If you answered yes above:

**i) What changes would you recommend?**

---

**ii) What do you feel are the principal organizational features that are needed for IUPAC to be more effective in the future?**

---

**iii) Are there other organizational or operational models of which you are aware that would be more effective or intrinsically less costly?**

---

**iv) In what ways could IUPAC simplify the administrative tasks and processes undertaken today?**

---

**14. What steps would you suggest for IUPAC to secure its financial sustainability?**

**i) How can IUPAC increase revenue?**

---

**ii) How can IUPAC lower its operating costs?**

---

**15. Could IUPAC benefit from using online platforms to solicit funds and ideas from the chemistry community?**

Yes

No

**Comments**

---

**Final comments if topics of your concern are not included above**

---

6 July 2021

Dear National Adhering Organisations,

The Executive Committee (EC) has reviewed the recommendations of both the Review Group and the attached discussion paper from Bureau Working Groups that were established to consider implementation of the recommendations. The EC feels that it is important to ensure full discussion and have a broad consensus if IUPAC is to embark on a process of change. The EC therefore welcomed the Bureau Working Groups contribution to this.

The EC fully endorsed the original recommendations from the Review Group and in particular the creation of a Science Board to drive the science strategy. The current Bureau, whilst inclusive, is very large and experience has shown that it is not a good forum for setting science priorities. This is a role largely delegated to the Divisions and Standing Committees.

We feel it is vital that:

1. The Science priorities and the way IUPAC addresses them must evolve in a more agile and responsive way, given the pace of change in the world today.
2. IUPAC must reduce the costs that derive from the complexity of our current organisation and processes. We need to simplify, focus and reduce the need for international travel if we are to be financially sustainable. We have to be able to show we spend scarce resources (money and volunteer time) wisely and efficiently if we are to attract additional funding and donations.

Any final proposals for change must, in our view, consider both these points and it is essential that the value of any proposed changes is measured against these criteria.

The Bureau Working Groups rightly considered governance as the driver for change. In considering the attached discussion paper the EC recommends that NAOs consider a number of questions and issues including:

- The future strategic role of the officers elected by Council
- The relationship between the Executive Board and the Science Board. Is there potential for constructive tension or alternatively could this lead to conflict between the two boards? The EB would be directly elected by Council. Should the SB be similarly elected?

- The make-up of the Science Board. Should this be the current Division Presidents and Standing Committee Chairs, or might this enshrine the current science organisation? How might objective external perspectives be introduced?
- The emerging implementation proposals are for relatively large boards to ensure inclusivity, but are there better ways to retain inclusivity whilst ensuring speed of decision-making and lower costs?

We will be organising discussion forums to facilitate NAO participation and engagement during the General Assembly. In the meantime, we welcome your views and perspectives by Email.

Yours sincerely,

A handwritten signature in blue ink that reads "Christopher M. A. Brett". The signature is written in a cursive, flowing style.

Prof. Christopher Brett

President IUPAC

## IUPAC Bureau Working Party Briefing Paper on Governance Structure

### Preamble

At the centenary 50<sup>th</sup> Council meeting in Paris in 2019, financial and administrative issues that would impact the Union as it transitions into its second century were discussed (item 3.2, finance group options workgroup paper; item 19.3, proposal to review IUPAC structures) and led Council to commission an Organizational Review.

In presenting its report in December 2020, the review group made key recommendations, including directions for the scientific work of the Union going forward, how to structure the Union to achieve its scientific objectives, and suggested work and governance changes that would reduce costs and improve efficiency. The report was endorsed by Executive Committee and then forwarded to Bureau for comment.

After extensive discussions during the first quarter of 2021 involving three separate working parties, the Bureau has prepared this short briefing paper specifically on the governance structure proposals as a basis for further discussion at the 51<sup>st</sup> (virtual) Council meeting in August 2021. A summary of the review process from July 2019 onwards is shown in Figure 1.

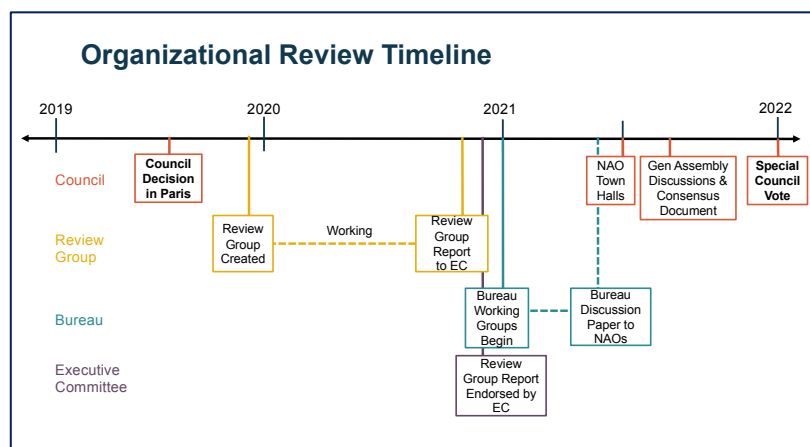


Figure 1: Progress of organisational review from July 2019 onwards.

Council is encouraged to consider the proposed changes and to refine a final proposal from which to draft changes to Statutes and Byelaws for presentation to a future Special Council Meeting for formal approval.

### Why does IUPAC need to consider changing its governance structure?

Many drivers in the current environment of accelerating science and widespread global challenges, including the coronavirus pandemic of 2019-2021, are fundamentally impacting how and how quickly scientists must communicate and collaborate and how IUPAC manages its work as an international scientific organization. As a predominantly volunteer organization, IUPAC faces persistent financial and human resource challenges.

The primary focus of IUPAC's effort should be on scientific issues. For over a century, IUPAC has been responsible for formulating recommendations for chemical concepts and data that facilitate exchange of scientific information. Ensuring that IUPAC standards become embedded in the core digital infrastructures, software and tools used in research across the chemical sciences will greatly increase the reach and visibility of IUPAC. As a respected international organization, it is imperative that IUPAC engage in response to common challenges of society as outlined in the UN Sustainability Goals. IUPAC is in a unique position as an established standards body to enable the exchange of critical data and development of robust digital technologies emerging in e-health, chemical discovery, environmental chemistry and other areas to analyse and address these global issues. It is critical that Divisions and Standing Committees, and their membership, are supported to continue their scientific and outreach activities.

The functions of the Union should be conducted transparently, with fiscal responsibility and in respect of the time, expertise and diversity of its scientific volunteers, the heart of IUPAC. The current governance structures are burdened by administrative considerations and lack of emphasis on scientific direction. The Bureau as the primary body that bridges the scientific work of the Divisions and Standing Committees is limited in its ability to focus on the core scientific mission with a large membership and infrequent meetings.

The review group recommended replacing the current Bureau-Executive Committee structure with two governance Boards, a Science Board (SB) and an Executive Board (EB), each reporting to Council, that cover the scientific and administrative matters. The recommendation reflects the Mission and core Values of the Union, as described in the Strategic Plan, and facilitates the Union's ability to address critical challenges.

It should be emphasised that this briefing paper focuses on governance structure, and so does not address operational and financial issues, both of which are critical to the future health of IUPAC. The vital role of the Secretariat in supporting the Divisions and Committees involved in the work of the Union is warmly acknowledged; discussion of the recommendations of the review group on the Secretariat is outside the scope of this briefing paper.

### **Responsibilities of the Proposed Boards – the Science Board (SB) and the Executive Board (EB)**

The Science Board (SB) is recommended as the body responsible for the Science work of IUPAC. It will review the outputs of individual divisions and standing committees in the core area of projects, conferences, publications, and outreach activities, and will provide support of chemistry in emerging areas. A key responsibility of the SB will be to set the long term scientific vision of the Union, and to facilitate inter-divisional and Standing Committee interactions and joint activities. In its discussions, Bureau noted that the SB would be encouraged to review the existing divisional and Standing Committee structure.

The Executive Board (EB) is recommended as the body overseeing the administrative operations of IUPAC, its financial aspects, setting priorities (in conjunction with the SB), fund raising and ensuring the financial health of IUPAC. These responsibilities include but are not limited to: oversight of Secretariat business; engaging with Committees; seeking sponsorship; and interactions with other agencies.

### **Composition of the Science Board (SB) and the Executive Board (EB):**

The review group indicated that the SB would consist of Division Presidents and Standing Committee Chairs, together with representation by Officers of IUPAC (see below), as well as by the Associate Director as an *ex-officio* non-voting member in their role as manager of projects and publications.

The review group report further recommended that EB would consist of the five Officers of the Union (President, Vice President, Immediate Past President, Secretary-General, and Treasurer) plus a number of elected members (EMs) nominated by the NAOs and elected by Council, as well as representation from membership of the SB. The EB would be chaired by the IUPAC President and the Executive Director would attend as an *ex-officio* non-voting member.

### **The Bureau now seeks the views of Council on the following questions:**

*Who should chair the Science Board?*

Bureau recommends that either the President or Vice President of IUPAC should chair the SB, in alignment with their statutory role.

*What should be the representation by EB on the SB (and vice versa)?*

Bureau recommends that the President, Vice-President and Secretary-General of IUPAC should all attend SB as *ex-officio* non-voting members.

The Bureau seeks input from Council on representation of SB members on the EB.

*How many elected members should sit on the EB, what are their terms of office, and what are their roles?*

Although the review group initially recommended five elected members should contribute to the work of the EB, members of the Bureau were keen to encourage diversity and breadth of experience in the EB membership, and so recommend 6-8 elected members.

*Should there be a Nominating Committee for the EB elections?*

Bureau recommends establishment of a Nominating Committee, and suggests that a Past President of IUPAC would be a suitable chair. The size and composition of the proposed Nominating Committee was not considered in detail by Bureau.

*How will the financial arrangements work?*

Bureau members acknowledge the need to establish an initial budget breakdown and that this process should be considered by the two Boards in conjunction with Council. **All financial plans would be proposals until such time as approved by Council.**

The concept that SB could use a portion of its budget for new directions, or for higher level or interdivisional/interdivision-inter SC activities was considered favourably by Bureau members.

*What are the lines of communication between the SB, the EB and Council?*

The remit of Council described in detail in Statute 5, i.e. as the governance body to which all other bodies of the Union are responsible, remains unchanged.

The organizational review group has proposed that joint meetings of the SB and EB occur frequently (~ six month intervals); Bureau members generally support this meeting frequency, although some have raised concerns about workload and time management issues for a volunteer “workforce”.

There was a view that the two boards should keep each other well informed about key decisions.

## **Conclusions**

This document summarizes discussions involving all members of the Bureau as they considered the Organizational Review report commissioned by IUPAC Council. As described above, the Bureau proposes details for the nature, size, role and interactions of the Executive and Science Boards, but there remains the need for specific input by Council.

**Prepared by the Working Party convenors (Mei-Hung Chiu, Mary Garson, Leah McEwen, and Chris Ober) on behalf of the 2020-2021 Bureau membership**

June 2021



## **PHYSICAL AND BIOPHYSICAL CHEMISTRY DIVISION**

### **Progress Report for the IUPAC 105<sup>th</sup> Bureau Meeting August 2021**

**Timothy J. Wallington, President**

**15<sup>th</sup> July 2021**

This report contains a summary of the aims, activities and priorities of Division I since the last report to the IUPAC Bureau in April 2020. The report follows the format set out by the IUPAC Secretary-General.

### **I. EXECUTIVE SUMMARY**

Progress over the past year has been slowed significantly by the pandemic and restrictions in travel. Nevertheless, all projects under Division I have been brought up to date over the past two years. Three projects were brought to a successful conclusion over the past year and there are no significant concerns for the ongoing projects. One new project (2021-006-2-100) has been started in the past year and Division I is contributing to a new project (2021-009-2-500) led by Division V. Elections for officers, TMs, AMs, and NRs for the 2022-2023 biennium were organized and held. Division I held GoToMeeting online meetings in December 2020 and March 2021 and plans a further GoToMeeting call in November 2021.

### **II. PLANS AND PRIORITIES**

An essential tool used by IUPAC to promote the common language in science and engineering is via the IUPAC Color Books (<https://iupac.org/what-we-do/books/color-books/>). These provide the world's authoritative resource for chemical nomenclature, terminology, and symbols. Terminology definitions published by IUPAC are drafted by international committees of experts in the appropriate chemistry sub-disciplines, and ratified by IUPAC's Interdivisional Committee on Terminology, Nomenclature and Symbols (ICTNS).

Commission I.1 is in the final stages of completing the abridged and the 4th edition of *Quantities, Units and Symbols in Physical Chemistry* (a.k.a. the Green Book). The book provides a compilation of widely used terms and symbols from many sources together with brief definitions.

Division I shares work on the project to update and digitize the Gold Book (2008) on Chemical Terminology. This is the IUPAC Compendium of Chemical Terminology and is the definitive

guide to chemical terminology. Cooperation in the initial stages is by CPCDS, Division V, and Division I. As work moves to the next stage in the next biennium, all IUPAC Divisions and ICTNS will be involved.

### **III. Overall Report of Division I and Commission I.1 activities during 2020-21.**

#### **Division I Aims**

The objectives of the Physical and Biophysical Chemistry Division have not changed since the last report. They are listed on the Division's webpage: <https://iupac.org/who-we-are/divisions/>.

The main goal of the Physical and Biophysical Chemistry Division is to organize and promote the international collaboration between scientists in physical and biophysical chemistry and related fields. In particular, collaborations are encouraged that address problems and formulate recommendations on nomenclature, symbols, units and terminology, as well as conventions in physical and biophysical chemistry.

#### **Projects are supported that:**

- foster the dissemination of the recommendations, the monitoring of their translations and their acceptance by the chemical community;
- establish and stimulate the use of methodologies, standards and reference materials in physical and biophysical chemistry;
- encourage the compilation and documentation of critically evaluated physico-chemical data;
- recognize new developments in physical and biophysical chemistry and their fields of applications;
- promote future-oriented activities important for the contribution of physical and biophysical chemistry to science and technology and to the needs of the world-community.

#### **Membership (2020-2021)**

**Officers:** **President** –Tim Wallington;  
**Vice President** – Pierangelo Metrangolo  
**Secretary** – Attila G. Császár;  
**Past President** – Ron Weir

**Titular Members (6):** Jeremy Frey, Frances Separovic, Zhigang Shuai, Hiroko Tokoro, Ilya Voets, and Angela Wilson.

**Associate Members (6):** Joaquim Faria, Vessala Tsakova, Modou Fall, Seung-Joon Jeon, Theo Kurten, and Luis Montero-Cabrera.

**National Representatives (6):** Ilya Vorotyntsev, Gordana Ciric-Marjanovic, Lynda Ngozi-Olehi, Renáta Oriňáková, Majdi Hochlaf, and Mohamed Deyab.

**Commission I.1**, whose focus is on Physicochemical Symbols, Terminology, and Units and is responsible for the contents of the Green Book. Its officers are as follows: Chair, J. McQuillan (New Zealand); Secretary, Roberto Maquardt (France); Titular Members, Y. Kuroda (Japan), R. Weir (Canada); Associate Members, S. Chalk (U.S.), G. Deng (China); National Representatives: J. Kaiser (UK), M. Quack (Switzerland); Ex Officio, T. Wallington.

### **Membership (2022-2023)**

**Officers:**   **President** – Pierangelo Metrangolo  
                  **Vice President** – Frances Separovic  
                  **Secretary** – Attila G. Császár  
                  **Past President** – Tim Wallington

**Titular Members (6):** Modou Fall, Joaquim Faria, Zhigang Shuai, Ilja Karina Voets, Angela Wilson, and Malgorzata Witko.

**Associate Members (6):** Kwok Feng, Terry Frankcombe, Luis Montero-Cabrera, Igor Schapiro, Hiroko Tokoro, and Vessela Tsakova

**National Representatives (6):** Jeremy Frey, Theo Kurten, Lynda Ngozi-Olehi, Renáta Oriňáková, Vudhichai Parasuk, and Miroslav Štěpánek.

The Division is supported by an Advisory Subcommittee made up of about 10 scientists. Its role is to advise on project proposals. It is composed of former Division members and scientists outside IUPAC.

The Rules of Operation for Division I were prepared and they were approved by the IUPAC Executive Committee at the GA (Paris) in July 2019. These rules serve as the working document for the biennium 2020-21 and beyond.

### **DIVISION I/COMMISSION I.1 PROJECTS**

A significant part of the activities is devoted to the identification of and support for projects.

#### **Ongoing projects listed in the May 31<sup>st</sup>, 2021 Financial Report are:**

**2007-032-1-100** Marquardt: *Green Book (Abridged version)*

**2011-037-2-100** Bazyleva: *Recommended reference materials for phase equilibrium studies*

**2012-044-1-100** Metrangolo: *Basic terminology of crystal engineering*

**2014-010-1-100** Froba: *Recommendation for the definition, preferred symbols for all transport properties*

**2014-021-1-100** Stohner: *Green Book revision Edition 5*

**2014-028-2-100** Turányi: *Chemical kinetics gas-phase elementary reaction at high temperatures*

**2015-002-2-100** Karger: *Diffusion in non-porous solids*

**2017-016-3-100** Wilthan: *ThermoML-2017 Revision of an XML based IUPAC standard for thermodynamic property data*

**2017-024-1-100** Wallington: *Evaluated kinetic data for atmospheric chemistry*

**2019-001-2-100** Frey: *Preparation of the 5th edition of the IUPAC green book*

**2019-025-1-100** Sander: *Henry's law constants*

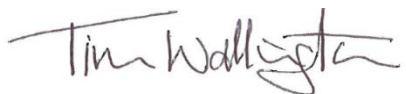
**2021-006-2-100** Resnati: *Categorizing interactions involving Group 11 elements*

**Division I projects completed over the past year are:**

**2016-031-2-100** McDowell: *Notation and conventions in molecular spectroscopy: Vibrational spectroscopy*

**2017-021-2-100** Iotti: *Chemical and biochemical thermodynamics reunification*

**2019-013-1-100** Bazyleva: *Good reporting practice for thermophysical and thermochemical property measurements*



Timothy J. Wallington, President  
Attila G. Császár, Secretary

**Report for Council Meeting – GA 2021 about ongoing and planned activities since the GA 2019 Council Meeting in Paris.****Executive Summary**

Division II deals primarily with three subfields, seen as part of the “Inorganic Chemistry” area, and with periodic table issues such as the approval and name-giving process of newly discovered elements. The periodic table issues are essential for the objective “Brand IUPAC in the minds of stakeholders”.

The division initiated contacts with the International Union of Physics, IUPAP, Commission 12 Nuclear Physics (C12) to facilitate future collaborations on approval and name-giving process of newly discovered elements. The two bodies now have a good working relationship. The final version of *On the discovery of new elements Report of the 2017 Joint Working Group of IUPAC and IUPAP*, Project 2017-014-2-200 was published in 2020.

The IUPAC Periodic Table Challenge 2.0 (Project 2020-004-1-050 a follow up from the 2019 International Year of the Periodic Table) went online in June 2020. The division was involved IYPT activities throughout 2019 and PP Reedijk and DP Öhrström were members of the management committee. DP Öhrström was special issue editor for Chemistry International, Issue 4 2019, “Elements of X”, featuring nine essays on the elements in somewhat different setting, from the class room (famous chemistry textbook author professor Peter Atkins) to the Lagos Fashion Week.

A report (Project 2015-039-2-200) on group 3 of the periodic table was published in the January issue of Chemistry International 2021 stating “...there is no objective means to adjudicate between group 3 consisting of Sc, Y, La and Ac or as Sc, Y, Lu and Lr.” The division considers the project closed.

The “Atom” members in our Division are associated with the Commission on Isotopic Abundances and Atomic Weights CIAAW, and its Subcommittee on Isotopic Abundance Measurements. We want to highlight *Atomic Weights of the Elements 2017* to be published soon in Pure and Applied Chemistry. This publication will include the recommended changes to the standard atomic weight of lead from  $207.2 \pm 0.1$ : to [206.14, 207.94], reflecting the occurrence of variations in the atomic weights of lead in normal terrestrial materials. Press release: <https://iupac.org/standard-atomic-weight-of-lead-revised/>.

The ownership of the ciaaw.org domain has been transferred to IUPAC.

The division membership 2020-21 was 17 men and 9 women (officers 2 men, 1 woman) and for 2022-23 it will be 18 men and 10 women (officers 2 men, 1 woman). The upcoming division president Lidia Armelao is the second woman to be DP, the first was the recently deceased Mary L. Good (1931-2019). Number of countries represented is up from 22 in this biennium to 23 in the coming. The geographic diversity is still good with members from western, central and eastern Europe, USA, Canada, Latin America, Africa, Middle East, South East Asia, China, Japan and Australia.

## **Plans and priorities for the remainder of this biennium, and beyond**

We need to stay tuned to the needs of our communities and stakeholders, nationally and internationally. An important task for all members is to identify these needs, and not just within their own special interests, and help initiate IUPAC projects that will keep us relevant and with a high visibility in all areas of inorganic chemistry

The division will resume the production and distribution of its annual Newsletter to keep the union and our stakeholders informed about division activities. Last issue was distributed 2019.

### ***1. Atom: Isotopic Abundances and Atomic Weights***

The “Atom” members in our Division have continued to be highly active and productive both inside and outside of IUPAC. These members are closely associated with the Commission on Isotopic Abundances and Atomic Weights CIAAW, and the Subcommittee on Isotopic Abundance Measurements, and most of them are involved in IUPAC projects. CIAAW has a primary role to publish evaluated isotopic compositions of the elements and their atomic weights and to provide technical opinion on related matters.

The CIAAW conducts active dialogue between external organizations and also with the IUPAC. The former is best reflected in the recent Memorandum of Understanding between the IUPAC and the BIPM (International Bureau of Weights and Measures) which explicitly recognizes the work of the CIAAW. In this capacity, members of the CIAAW work closely with the CCQM Isotope Ratio working group in the area of isotope ratio measurement capability and maintenance of isotope delta scales for light elements. Members of the CIAAW are also actively engaged with the Joint Committee on Guides in Metrology where IUPAC is one of the eight member organizations. In addition, the CIAAW formally collaborates with IUPAC Committee on Publications and Cheminformatics Data Standards towards making our work more accessible and transparent in the digital space.

### ***2. Elements and Periodic Table issues***

A key strategy is to maintain close connections with the International Union of Physics, IUPAP, and its Commission 12 Nuclear Physics (C12). Interdivisional collaborations with for example the Committee on Chemical Education is important for all issues related to the periodic table.

***3. Molecular Inorganic Chemistry:*** A significant fraction of Division members belongs to the “molecules” area, including coordination chemistry, organometallic chemistry, bioinorganic chemistry, transition metal catalysis and main group chemistry. Nomenclature of inorganic chemistry is primarily covered in Division VIII, although terminology of new classes of compounds is of particular interest to our Division.

***4. Solid State Inorganic and Materials Chemistry.*** The members of this group are associated with the activity of Subcommittee on Materials Chemistry, and with contribution from Solid State High-temperature Materials Chemistry. The Subcommittee on Materials Chemistry is exploring together with Division I ways of expanding the significance of Materials Chemistry with IUPAC and increasing the interaction between IUPAC and the Materials Chemistry user communities.

## **An overall report of Division/Committee activities and achievements**

Our activities are displayed in relation to the unions Goals and Objectives

### **1. GOALS**

*1.1 Provide scientific expertise to address critical world needs.*

- Variation of lead isotopic composition and atomic weight in terrestrial materials (IUPAC Technical Report) by Xiang-Kun Zhu et al [Oct 2020]. Pure Appl Chem 93, 155-166 (2021)
- Interpretation and use of standard atomic weights (IUPAC Technical Report) by Adriaan van der Veen et al [ASAP, March 2021].
- Project 2019-001-2-100, Preparation of the 5th Edition of the IUPAC Green Book, chaired by J. Frey (IUPAC Div I). Recently the CIAAW has endorsed a symbol for the standard atomic weight, Aro(E), so it can be distinguished from the more general atomic weight, Ar(E). This symbol is in agreement with the guidance of the Green Book and will appear in the TSAW-2019.
- Project 2018-030-2-200, Toward a comprehensive definition of valence, Chair Pavel Karen
- Project 2015-053-1-200, Survey of Definitions and Use of Common Solid-State Chemistry Terminology
- Project No.: 2019-016-3-800 Nomenclature and Associated Terminology for Inorganic Nanoscale Particles
- Gold Book Update of Terms for Inorganic Chemistry Project No.: 2020-022-1-200
- Project 2019-001-2-100, Preparation of the 5th Edition of the IUPAC Green Book. CIAAW has endorsed a symbol for the standard atomic weight, Aro(E), so it can be distinguished from the more general atomic weight, Ar(E).
- The Division is involved in the Interdivisional Subcommittee of the Critical Evaluation of Chemical Data
- After discussions between the task group and the division the final version of On the discovery of new elements (IUPAC/IUPAP Report) Report of the 2017 Joint Working Group of IUPAC and IUPAP, Project No.: 2017-014-2-200 was published online in PAC, August 4, 2020.
- Project 2018-030-2-200 Toward a comprehensive definition of valence, Chair Pavel Karen.
- Project 2015-053-1-200, Survey of Definitions and Use of Common Solid-State Chemistry Terminology delivered an interim report in July 2020.
- Project 2019-016-3-800 Nomenclature and Associated Terminology for Inorganic Nanoscale Particles

- Project 2014-001-2-200, Terminology guidelines and database issues for topology representations in coordination networks, metal-organic frameworks and other crystalline materials
- Project 2011-035-1-800, Terminology and Nomenclature of Inorganic and Coordination Polymer

### *1.2 Increase the value of our products and services.*

- In 2020 the legal ownership of the [ciaaw.org](http://ciaaw.org) domain was transferred to IUPAC (from CIAAW emeritus Dr Ty Coplen). Among others, this allowed [ciaaw.org](http://ciaaw.org) to operate under the secure hypertext transfer protocol ([https](https://)). In addition, operating in the new environment provides CIAAW the ability to host computational facilities from its own server at added cost. The beta release of the IUPAC Molecular Weight Calculator is now accessible from <https://apps.ciaaw.org> and will soon be advertised publicly.
- Project 2019-020-2-024, Machine-Accessible Periodic Table, co-chaired by L. McEwen (IUPAC Committee on Publications and Cheminformatics Data Standards) and J. Meija (CIAAW). The current standard atomic weights, nuclide masses, and isotopic abundances are openly available in a tabular and searchable format on the website of the CIAAW. This joint project between the CIAAW and the CPCDS is to revise the data management practices for [ciaaw.org](http://ciaaw.org) and to also make its data machine readable and richly annotated to enable accurate dissemination in chemical computer systems and to further adhere to the FAIR Data Principles.

### *1.3 Improve the vitality, effectiveness and efficiency of our Union.*

- The division will resume the production and distribution of its annual Newsletter to keep the union and our stakeholders informed about division activities. Last issue was distributed 2019

## 2. OBJECTIVES

### *2.1 Brand IUPAC in the minds of stakeholders*

- The IUPAC Periodic Table Challenge 2.0 (Project No.: 2020-004-1-050)
- A provisional Report (Project No.: 2015-039-2-200) on *Discussions on Group 3 of The Periodic Table* was published by Eric Scerri in the January 22 issue of *Chemistry International* 2021 (p31-34). It is noted in the very beginning that "...we have concluded that there is no objective means to adjudicate between group 3 consisting of Sc, Y, La and Ac or as Sc, Y, Lu and Lr." Therefore the division do not expect a formal final report in PAC and considers the project closed.
- The division is running a Gold Book Update of Terms for Inorganic Chemistry Project No.: 2020-022-1-200
- The DP and the division have initiated contacts with the IUPAP Commission 12 Nuclear Physics (C12). The C12 Chair Claes Fahlander gave a short presentation via internet at the Division II meeting in Paris, and the DP gave a similar presentation of Division II and the IUPAC Periodic Table activities at the C12 meeting in Glasgow at the end of July. The C12 Chair and the DP meet again at the end February 2020. The DP has also established and met with the incoming C12 chair Ani Aprahamian.

## *2.2 Improve quality and frequency of communication with stakeholders*

-The aforementioned Newsletter and our new relation with C12 of IUPAP. [https://iupac.org/wp-content/uploads/2019/01/Div\\_II\\_newsletter2018\\_0104.pdf](https://iupac.org/wp-content/uploads/2019/01/Div_II_newsletter2018_0104.pdf)

## *2.3 Increase revenue*

- We have no explicit actions for increased revenue to report, however, the successful co-location of off-year meetings have significantly reduced expenditure and also increased the attendance of these.

## *2.4 Expand and retain Member and volunteer base with an emphasis on diversity and inclusion.*

- The two recent nominating committees have worked hard on this. The division membership 2020-21 was 35% women and for 2022-23 it will be 36%. The upcoming division president Lidia Armelao is the second woman to be DP, the first was the recently deceased Mary L. Good (1931-2019, DP 1981-1985, the first woman to be IUPAC DP). Number of countries represented is up from 22 in this biennium to 23 in the coming. The geographic diversity is good with members from western (8), central and eastern (1) Europe, USA (2), Canada (1), Latin America (1), Africa (2), Middle East (3), South East Asia (3), China (2), Japan (2) and Australia (1).

- The DP is still working on capitalizing from the 2018 division off-year meeting in Gaborone, Botswana, one of only two such meetings held outside high-income countries in 2018. A report was published in 2019 (L. Öhrström & I. Masesane, Bringing IUPAC to Southern Africa, *Chemistry International* 2019, 41 (2), 38-40).

## *2.5 Enhance interdivisional interaction and collaboration*

- We work since long with Div VIII (i.e. Nomenclature for metallacycles containing transition metals) and CCE (i.e. Periodic table of isotopes, Periodic table challenge) with many successful projects. Many projects touches upon multiple divisions as the Inorganic and coordination polymers (2011-035-1-800) with Div IV and Div VIII. Recently the division has also provided expertise to the Div VI Project 2014-031-3-600, The environmental and health challenges of e-waste and its management: an emerging 21st century global concern.

## *2.6 Emphasize multidisciplinary projects addressing critical global issues*

- The above mentioned e-waste project.

## *2.7 Support chemistry education, particularly in developing countries*

- The IUPAC Periodic Table Challenge 2.0 (Project No.: 2020-004-1-050)

**IV. Tabular material.** *This should include a list of publications since 2019 relevant to the IUPAC Division/Committee.*

- Zhu, X., Benefield, J., Coplen, T. B., Gao, Z., & Holden, N. E. (2020). Variation of lead isotopic composition and atomic weight in terrestrial materials (IUPAC Technical Report), *Pure and Applied Chemistry* (AOP 1 Oct 2020); <https://doi.org/10.1515/pac-2018-0916>
- Adriaan van der Veen et al, “Interpretation and use of standard atomic weights (IUPAC Technical Report)” *Pure and Applied Chemistry*, (AOP 26 Apr 2021); <https://doi.org/10.1515/pac-2017-1002>  
*Pure Appl Chem*
- Hofmann et al. “On the discovery of new elements” *Pure and Applied Chemistry*, 2020, 92(9), 1387-1446 <https://doi.org/10.1515/pac-2020-2926>
- ‘Purchase, D., Abbasi, G., et al. Global occurrence, chemical properties, and ecological impacts of e-wastes (IUPAC Technical Report)’, by *Pure Appl. Chem.* (2020); <https://doi.org/10.1515/pac-2019-0502>
- Öhrström and Masesane, "Bringing IUPAC to Southern Africa" *Chemistry International*, 2019, 41(2), pp. 38-40. <https://doi.org/10.1515/ci-2019-0215>
- Öhrström ed. special issue “Elements of X” *Chemistry International*, 2019 41(4), <https://www.degruyter.com/journal/key/CI/41/4/html>
- Scerri “Provisional Report on Discussions on Group 3 of The Periodic Table” *Chemistry International*, 2021, 43(1), pp. 31-34. (<https://doi.org/10.1515/ci-2021-0115>; [PDF](#))

Among endorsed conferences we can mention 7<sup>th</sup> Asian Conference on Coordination Chemistry, 15-18th October 2019 at Putra World Trade Centre (PWTC), Kuala Lumpur, <https://iupac.org/event/7th-asian-coordination-chemistry-conference-acc7/>

## Running projects

<a href="#">2020-022-1-200</a>	<a href="#">Gold Book Update of Terms for Inorganic Chemistry</a>
<a href="#">2020-016-3-020</a>	<a href="#">The Gender Gap in Chemistry – Building on the ISC Gender Gap Project</a>
<a href="#">2020-013-1-200</a>	<a href="#">Assessment of absolute isotope ratios for the international isotope delta measurement standards</a>
<a href="#">2020-004-1-050</a>	<a href="#">IUPAC Periodic Table Challenge 2.0</a>
<a href="#">2019-020-2-024</a>	<a href="#">Machine-Accessible Periodic Table</a>
<a href="#">2019-024-1-200</a>	<a href="#">Statistical Models and Data Reductions to Estimate Standard Atomic Weights and Isotopic Ratios for the Elements, and to Evaluate the Associated Uncertainties</a>
<a href="#">2019-016-3-800</a>	<a href="#">Nomenclature and Associated Terminology for Inorganic Nanoscale Particles</a>

<a href="#"><u>2018-030-2-200</u></a>	<a href="#"><u>Toward a comprehensive definition of valence</u></a>
<a href="#"><u>2017-023-2-200</u></a>	<a href="#"><u>Collection, compilation and evaluation of elemental and isotopic data of calcium carbonate and hydroxyapatite materials</u></a>
<a href="#"><u>2017-039-2-800</u></a>	<a href="#"><u>Graphical Representation of Polymer Structures</u></a>
<a href="#"><u>2017-036-2-800</u></a>	<a href="#"><u>Graphical Representation Standards for Chemical Reaction Diagrams</u></a>
<a href="#"><u>2017-030-2-041</u></a>	<a href="#"><u>Metrics for Green Syntheses</u></a>
<a href="#"><u>2017-017-2-200</u></a>	<a href="#"><u>Evaluated Published Isotope Ratio Data (2013-2018)</u></a>
<a href="#"><u>2015-053-1-200</u></a>	<a href="#"><u>Survey of Definitions and Use of Common Solid-State Chemistry Terminology</u></a>
<a href="#"><u>2015-039-2-200</u></a>	<a href="#"><u>The constitution of group 3 of the periodic table</u></a>
<a href="#"><u>2015-030-2-200</u></a>	<a href="#"><u>Assessment of fundamental understanding of isotopic abundances and atomic weights of the chemical elements (2016-2017)</u></a>
<a href="#"><u>2015-037-2-200</u></a>	<a href="#"><u>IUPAC Molecular Weight Calculator</u></a>
<a href="#"><u>2014-016-2-200</u></a>	<a href="#"><u>Compilation of the variation of the isotopic composition of the elements via crowdsourcing</u></a>
<a href="#"><u>2014-002-1-200</u></a>	<a href="#"><u>Assessment of Stable Isotopic Reference Materials</u></a>
<a href="#"><u>2014-001-2-200</u></a>	<a href="#"><u>Terminology guidelines and database issues for topology representations in coordination networks, metal-organic frameworks and other crystalline materials</u></a>
<a href="#"><u>2013-037-1-200</u></a>	<a href="#"><u>Creating Educational Website for Materials Chemistry</u></a>
<a href="#"><u>2012-036-2-200</u></a>	<a href="#"><u>Recommendations for Isotope Data in the Geosciences-II</u></a>
<a href="#"><u>2011-035-1-800</u></a>	<a href="#"><u>Terminology and Nomenclature of Inorganic and Coordination Polymer</u></a>
<a href="#"><u>2009-046-2-200</u></a>	<a href="#"><u>Terminology and definition of quantities related to the isotope distribution in elements with more than two stable isotopes</u></a>

# IUPAC Organic and Biomolecular Division III

## Reports to Reports to Council 2021

*Nikolay E. Nifantiev*

### **I. Highlights and/or Executive Summary.**

The mission of the Division of Organic and Biomolecular Chemistry is to oversee activity in the field of organic and biomolecular chemistry in the broadest sense. Main pillar of the activities consist in: a) defining common languages, standards and data collections, suitable in particular for the new IT era; b) promoting a strong interaction with the scientific community of organic and biomolecular chemists, in which the IUPAC must be the reference institution; and c) developing communication/dissemination activities aimed at the general public, to spread the chemical culture and inform on the importance of chemical innovation for social well-being.

Division III promotes and endorses projects oriented not only on standardization, collections of data, activities aimed at disseminating the chemical culture in the less favored regions; but also educational projects oriented on the communication to the wide public of the relevance of chemistry in everyday life.

The strong interaction with the scientific community of organic and biomolecular chemists is mainly performed by organizing the most relevant conference cycles in the different areas of interest of organic and biomolecular chemistry, ranging from traditional areas such as organic synthesis or physical organic chemistry, to more wide and frontier areas such as biotechnology. Particular efforts are devoted to stimulate the multidisciplinary and translational capacity of organic and biomolecular chemists, endorsing conferences, such as the International Conference on Organic Synthesis, the International Biotechnology Symposium, the International Carbohydrate Symposium or the International Conference on Biodiversity, in which a fruitful interchange with expert in other disciplines is favored.

Division III believes that a relevant contribution to the scientific community consists in providing the “IUPAC quality mark” to the International Conferences of undisputed high scientific level in an era in which we witness the multiplication of commercial “predatory” conferences in which paid invited lectures are distributed. In the 2020-2021 biennium Division III planned to endorse 8 international Conferences that are part of a longstanding series (see detail below). Due to pandemic restrictions all these conferences were rescheduled for 2022-2023 and even for 2024 as outlined below in Suppl. Table.

Division III oversees the biannual awarding of the Thieme-IUPAC Prize for Organic Synthesis for scientists under the age of 40 years whose research has had a major impact on the field of synthetic organic chemistry. The 2020 Thieme–IUPAC Prize has been awarded to Professor Ang Li of the Shanghai Institute of Organic Chemistry, CAS (China) for his outstanding investigations towards the total synthesis of structurally and biologically interesting natural products. It was planned that the prize should be presented at the ICOS-23 (Shanghai, China; October 18-23, 2020) followed by Thieme–IUPAC lecture to be delivered by awardee. The ICOS23 was rescheduled to October 16-21, 2022.

Division III consists of a Division Committee (comprising 10 Titular members, 6 Associate Members and 10 National Representatives) and five Sub-committees that oversee the activities in specific areas of organic and biomolecular chemistry. Division III is also involved into activity of Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD) which acted initially as the Subcommittee on Green Chemistry of Division III.

## II. Plans and priorities for the remainder of this biennium, and beyond

The scientific interests of Division III cover the fundamental and applied aspects of organic chemistry. Central to the Division is the topic of organic synthesis, an enabling science, covering topics as diverse as new reactions and reagents, the asymmetric synthesis of natural products, transition metal catalysts, organocatalysis, organometallic chemistry, enzyme aided synthesis and methods for green synthesis. In the bio-molecular area, key topics include natural products (isolation, characterization and exploitation in different areas such as drug, cosmetics nutraceuticals); protein, nucleic acids and glyco-chemistry, including structural characterization (-omics), synthesis and application in biomedical research; contribution of organic chemistry to the wide area of biotechnology. The Division strongly encourages multidisciplinary research. Strong links into physical chemistry through spectroscopy and/or organic analysis are well established. The Division also has close association with medicinal chemistry; with inorganic chemistry, especially in the area of catalysis; and with polymer chemistry in the area of biopolymers.

The main program of activities are listed in the summary: a) defining common languages, standards and data collections, suitable in particular for the new IT era; b) promoting a strong interaction with the scientific community of organic and biomolecular chemists, in which the IUPAC must be the reference institution; and c) developing communication/dissemination activities aimed at the general public, to spread the chemical culture and inform on the importance of chemical innovation for social well-being.

The program activities are conducted with two instruments: firstly via a series of well-established international conferences, and secondly through the IUPAC project system. This Division coordinates these scientific topics through five sub-committees as well as by involvement in interdivisional activities. Rotation of leadership and succession planning within the five sub-committees is actively encouraged. The five sub-committees and their elected Chairs are:

*Sub-Committee on Organic Synthesis (Chair: Nikolay Nifantiev, Russia – to be rotated)*

*Sub-Committee on Biomolecular Chemistry (Chair: Zhen Xi, China)*

*Sub-Committee on Biotechnology (Chair: Fengwu Bai, China)*

*Sub-Committee on Photochemistry (Alex Griesbeck, Germany)*

*Sub-Committee on Structural and Mechanistic Organic Chemistry (Chair: Ian Williams, UK)*

These sub-committees used to meet annually (in 2020-2021 – mainly in the on-line remote mode), and will e-meet again at the biannual General Assembly.

## III. An overall report of Division/Committee activities and achievements during 2020-2021 and plans for next biennium *organized by the Goals and Objectives laid out in the current IUPAC Strategic Plan*

### **Division III improves quality and frequency of communication with stakeholders.**

Scientific discussion: During the biennium 2020-2021, the Division planned to oversee arrangements for 8 international conference series, many of which are meetings of long-standing within the IUPAC conference calendar. Division conferences are traditionally well supported by younger chemists, and several activities within these meetings target this age group. The majority of these meetings provide poster prizes to student delegates, and some host workshops designed for young researchers to meet with plenary speakers.

Division III believes that a relevant contribution to the scientific community consists in providing the “IUPAC quality mark” to the International Conferences of undisputed high scientific level in an era in which we witness the multiplication of commercial “predatory” conferences in which paid invited lectures are distributed. In the 2020-2021 biennium Division III planned to endorse 10 international Conferences that are part of a longstanding series (see detail below). Due to pandemic restrictions all these conferences were rescheduled for 2022-2023 and even for 2024 as outlined below in Suppl. Table.

Details of Division conferences of 2020-2021 and planned further conferences are provided below in the chapter IV in this report. Division encourages conference organisers to publish their reports in *CI* and paper collections in *Pure & Applied Chemistry* related to plenary and invited reports being delivered in the endorsed conferences. Unfortunately this important form of Division III activity was shifted for the future due to the rescheduling of endorsed conferences.

The Division Division III oversees the biannual awarding of the Thieme-IUPAC Prize for Organic Synthesis for scientists under the age of 40 years whose research has had a major impact on the field of synthetic organic chemistry. This prize is generously supported by the scientific publisher Thieme and includes an award of €5000. The the 2020 Thieme–IUPAC Prize has been awarded to Professor Ang Li of the Shanghai Institute of Organic Chemistry, CAS (China) for his outstanding investigations towards the total synthesis of structurally and biologically interesting natural products. It was planned that the prize should be presented at the ICOS-23 (Shanghai, China; October 18-23,2020) followed by Thieme–IUPAC lecture to be delivered by awardee. Unfortunately, the ICOS23 was rescheduled and it was decided by Thieme to announce the call for next Thieme-IUPAC Prize after the ICOS23. Information about the call of 2020: <https://www.thieme.de/en/thieme-chemistry/thieme-iupac-prize-55182.htm> and the press-release about 2020 awardee [https://www.thieme.de/en/thieme-chemistry/current-winner-thieme-iupac-prize-59023.htm?utm\\_campaign=chemistry--thieme-iupac-prize&utm\\_source=themen-rl&utm\\_medium=email&utm\\_content=20k5c2\\_20o1bv\\_20ord5](https://www.thieme.de/en/thieme-chemistry/current-winner-thieme-iupac-prize-59023.htm?utm_campaign=chemistry--thieme-iupac-prize&utm_source=themen-rl&utm_medium=email&utm_content=20k5c2_20o1bv_20ord5)

### **Division III provides scientific expertise to address critical world needs.**

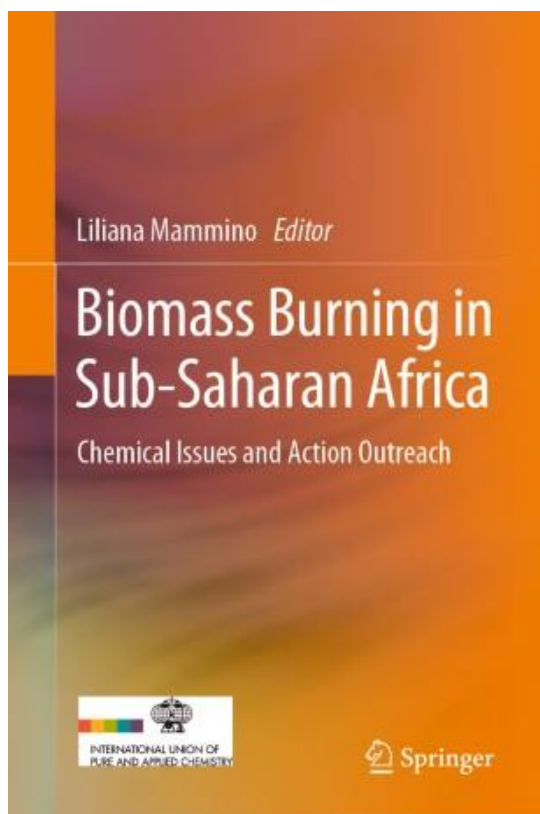
Division III conferences, particularly the International Biotechnology symposia, provide an opportunity to link industry-based chemists with those from universities and the government sector. As example, a project launched in 2015 (Healthy Life and Active Ageing: the Contributions of Functional Food Ingredients; PI Prof. Amelia Rauter) seeks to bring chemistry to the general public, demonstrating through the implementation of an interactive website, how chemistry offers unique solutions for society needs in terms of a healthy living and a better ageing. A video was generated with a discussion on the impact in health of the combination of food components. The project has a continuation in a new project entitled “Bridging ethnic food cultures through chemistry” (Rauter, 2017-037-1). This activity was enlarged and new project application related to the subject is under preparation.

Another project in which IUPAC provides scientific expertise to address critical world needs concerns the “Human health risk consideration on nano-enabled pesticides for industry and regulators” (2017-035-1). Members of Division III are also closely involved into the “The Environment, Health and Food Safety Impact of Microplastics” (IUPAC Project No.: 2019-026-2-600, 2019-2020).

Particularly relevant in this context is also the project “International Workshop on the Impact of Scientific Developments on the Chemical Weapons Convention” (2017-001-14) and the participation to the meeting organised as the IUPAC-OPCW side event and other meetings in

the frame of RC4 and CSP23 of IPCW (November, 2018, The Hague) and following meetings.

The project 2007-025-1-300 (Mammino) was successfully finished with publication a book "Biomass Burning in Sub-Saharan Africa. Chemical Issues and Action Outreach, Editor: Mammino, see below) which offers a comprehensive overview of the various aspects involved in biomass burning, highlighting the complexity of the phenomenon and the ensuing challenges for the design of approaches aimed at reducing fires in the open air.



**Book Title:** Biomass Burning in Sub-Saharan Africa

**Book Subtitle:** Chemical Issues and Action Outreach

**Editors:** Liliana Mammino

**DOI:** 10.1007/978-94-007-0808-2

**Copyright Information:** Springer Nature B.V. 2020

**Publisher Name:** Springer, Dordrecht

**Hardcover ISBN:** 978-94-007-0807-5

**eBook ISBN:** 978-94-007-0808-2

**Number of Pages:** XII, 160

**Number of Illustrations:** 8 b/w illustrations, 21 illustrations in colour

### **Division III supports chemistry education, particularly in developing countries**

Particular attention has been devoted to project and conferences involving developing countries. A discounted registration fee was applied to the participants of developing countries in all the Symposia organized under the auspices of IUPAC, and attention has been posed on the geographical location of the event in order to favour the participation of delegates from Africa, Asia and South America (see conferences). Due to pandemic restrictions all these conferences were rescheduled for 2022-2023 and even for 2024 as outlined below in Suppl. Table.

A number of Division III projects are strongly linked to chemistry in developing countries. Examples include: a) Strategic Planning for a new Network for Heterocyclic Chemistry among Countries of the Mediterranean Sea Area, including Europe and North Africa (2015-027-1-300) ; b) Bridging ethnic food cultures through chemistry (2017-037-1) (see above).

### **Division III expands and retains member and volunteer base with an emphasis on diversity and inclusion.**

In terms of geographical representation in the 2020-2021 biennium, the Division III committees comprises representatives from Europe (6 x TM, 2 x AM, 5 x NR), Asia (1 x TM,

4 x AM, 2 x NR), America (1 x TM, 1 x NR), Africa (1 x TM, 1 x AM), the Middle East (1 x NR), Oceania (1 x TM). In diversity matters, the Division has five female Members, among which the Division Vice-President.

#### IV. Tabular materials.

#### CONFERENCES

##### Conferences organized by Division III that are part of a longstanding series

International Conference on Organic Synthesis (ICOS)	<p>22<sup>nd</sup> ICOS, Florence, Italy, 16-21 September 2018, <a href="http://www.22-icos-florence.it">http://www.22-icos-florence.it</a></p> <p>23<sup>rd</sup> ICOS, Shanghai, China, 18-23 October 2020, <a href="http://icos2020.sioc.ac.cn/dct/page/1">http://icos2020.sioc.ac.cn/dct/page/1</a></p> <p><b>Due to the COVID-19 pandemic and the uncertainties in the following months, the organizing committee of 23-ICOS, proposed to reschedule the conference to October 16-21, 2022. The conference venue will still be in the campus of ShanghaiTech University. 24-ICOS will be 2 years after in Poland.</b></p>
International Symposium on the Chemistry of Natural Products (ISCNP) and International Conference on Biodiversity (ICOB)	<p>ISCNP30 &amp; ICOB10 Athens, Greece, 25-29 November 2018, <a href="https://www.iscnp30-icob10.org/">https://www.iscnp30-icob10.org/</a></p> <p>ISCNP31 &amp; ICOB11 October 25<sup>th</sup> – 29<sup>th</sup> 2020 in Napoli, Italy, <a href="https://www.iscnp31-icob11.org/">https://www.iscnp31-icob11.org/</a></p> <p><b>postponed for 24-28 October 2021</b></p>
International Symposium on BioOrganic Chemistry (ISBOC)	<p>ISBOC-12, December 15-18th, 2019, ShenZhen, China.</p> <p>ISBOC-13, October 23-26, 2021, Singapore. It will be organized by Professor Bengang Xing of Nanyang Polytechnic University (<a href="https://personal.ntu.edu.sg/bengang/">https://personal.ntu.edu.sg/bengang/</a>)</p>
International Carbohydrate Symposium (ICS)	<p>29<sup>th</sup> ICS, Lisbon, Portugal, 14-19 July 2018, <a href="http://www.ics2018.eventos.chemistry.pt/">http://www.ics2018.eventos.chemistry.pt/</a></p> <p>30<sup>th</sup> ICS, Shanghai, China, 12-17 July 2020, <a href="http://ics2020.sioc.ac.cn">http://ics2020.sioc.ac.cn</a> – <b>postponed till 2024.</b></p> <p>ICS-2022, Florianópolis, Brazil, 10-14 July 2022.</p>
International Biotechnology Symposium (IBS)	<p>18<sup>th</sup> IBS, Montreal, Canada, 12-17 August 2018, <a href="http://www.ibs2018.org">http://www.ibs2018.org</a></p> <p>19<sup>th</sup> IBS, Maastricht, Netherlands, June 28 – July 01, 2020, <a href="https://www.ecb2020.com/">https://www.ecb2020.com/</a> - <b>congress postponed until 9-12</b></p>

<b>May 2021</b>	
International Conference on Physical Organic Chemistry (ICPOC)	<p>24<sup>th</sup> ICPOC, Faro, Portugal, 1-6 July 2018, <a href="https://iupac.org/event/icpoc-24/">https://iupac.org/event/icpoc-24/</a></p> <p>25<sup>th</sup> ICPOC, Hiroshima, Japan, 5-10 July 2020, <a href="https://icpoc25.jp/">https://icpoc25.jp/</a> - <b>ICPOC-25 has been postponed to July 10-15 2022 (same venue) because of the bad situation caused by the spread of infection of COVID-19.</b></p>
International Conference on Phosphorus Chemistry (ICPC)	<p>22<sup>nd</sup> ICPC, Budapest, Hungary, July 8-13, 2018, <a href="http://www.icpc22.mke.org.hu/welcome.html">http://www.icpc22.mke.org.hu/welcome.html</a></p> <p>23<sup>rd</sup> ICPC, Ningbo, China, May 31 – June 04, 2020, <a href="http://www.icpc23.org/">http://www.icpc23.org/</a> - <b>cancelled</b></p> <p>24<sup>th</sup> ICPC is scheduled to the year of 2023 (24th ICPC) and the finalized dates will be announced later.</p>
IUPAC International Symposium on Photochemistry (PhotoIUPAC)	<p>27th, Dublin, Ireland, July 8-13, 2018 <a href="http://photoiupac2018.com/">http://photoiupac2018.com/</a></p> <p>28th, Amsterdam, Netherlands, 12-17 July 2020 <a href="https://photoiupac2020.amsterdam/">https://photoiupac2020.amsterdam/</a> <b>rescheduled for July 17-22, 2022</b></p>

**Division III members organized conferences which had previously (before 2019) the endorsement by IUPAC**

International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS)	<p>20<sup>th</sup> OMCOS, Heidelberg, Germany, July 21-25, 2019. <a href="https://www.omcos2019.de/">https://www.omcos2019.de/</a></p> <p>21<sup>st</sup> OMCOS, Vancouver, Canada, July 25-29, 2021. <a href="https://omcos2021.ca/">https://omcos2021.ca/</a> <b>rescheduled for July 24-28, 2023</b></p>
International Symposium on Glycoconjugates (GLYCO)	<p>GLYCO25, Milano, Italy, 25-31 August 2019</p> <p>GLYCO26, Taipei, Taiwan, August 29 – September 3, 2021, <a href="http://glyco26.org/">http://glyco26.org/</a> <b>rescheduled for Aug 27 – Sept 01, 2023</b></p>

**PROJECTS**

<b>Projects completed during the 2020-2021 biennium</b>	<b>Proposed by Div.III</b>	<b>Supported by Div.III</b>
Book: Biomass Burning in Sub-Saharan Africa. Chemical Issues and Action Outreach, Editor: Mammino, Project No.:2007-025-1-300. Released in February 2020, the book (ISBN 978-94-007-0807-5) offers a comprehensive overview of the various aspects involved in biomass burning, highlighting the complexity of the phenomenon and the ensuing challenges for the design of approaches aimed at reducing fires in the open air. <a href="https://iupac.org/project/2007-025-1-300">https://iupac.org/project/2007-025-1-300</a>	X	

<b>New project proposals during the 2020-2021 biennium</b>	Proposed by DivIII	Supported by Div.III
THE ENVIRONMENT, HEALTH AND FOOD SAFETY IMPACT OF MICROPLASTICS (2019-026-2-600, from Dec 01, 2019)		X
"GUIDELINES ON DEVELOPING ROBUST BIOCATALYSTS FOR BIOREFINERY" - IUPAC PROPOSAL # 2019-046-3-300 (BAI), under step 4 of review.	X	X
BRIDGING ETHNIC FOOD CULTURES THROUGH CHEMISTRY (#2017-037-2-300), <i>Rauter, approved in January 2019</i>	X	X
BUILDING BROADER AND DEEPER LINKS BETWEEN OPCW AND IUPAC (#2018-022-3-020)		X
METRICES FOR GREEN CHEMISTRY (#2017-030-2-041), <i>Tundo</i>	X	X

<b>Project proposals during the 2020-2021 biennium</b>	Proposed by DivIII	Supported by Div.III
2021-005-1 " Green Chemistry in Sub-Saharan Africa" (Liliana Mammino)	X	X
S/C photochemistry works under the preparation of two new grant applications		

<b>Projects previously approved that remain current</b>		
INTERNATIONAL YEAR OF THE PERIODIC TABLE OF CHEMICAL ELEMENTS (IYPT) IN 2019: PLANNING, COORDINATION AND IMPLEMENTATION (#2018-005-2-020)		X
A CRITICAL REVIEW OF REPORTING AND STORAGE OF NMR DATA FOR SPIN-HALF NUCLEI IN SMALL MOLECULES (2016-023-2-300) Garson	X	
CATEGORIZING CHALCOGEN, PNICTOGEN, AND TETREL BONDS, AND OTHER INTERACTIONS INVOLVING GROUPS XIV-XVI ELEMENTS (2016-001-2-300) Resnati	X	
4TH INTERNATIONAL WORKSHOP ON THE IMPACT OF SCIENTIFIC DEVELOPMENTS ON THE CHEMICAL WEAPONS CONVENTION (2017-001-020) Forman		X
HUMAN HEALTH RISK CONSIDERATION ON NANO-ENABLED PESTICIDES FOR INDUSTRY AND REGULATORS" (2017-035-1). Johnston		X
DEVELOPING DATABASE ON MOLECULAR COMPOSITIONS OF NATURAL ORGANIC MATTER AND HUMIC SUBSTANCES AS MEASURED BY HIGH RESOLUTION MASS SPECTROMETRY (2016-015-2-600) Perminova		X
IUPAC'S ROLE IN DEVELOPING INTERDISCIPLINARY/ COLLABORATIVE WORK IN THE CHEMISTRY COMMUNITY AND BEYOND. THE FOCUS FOR THE 2017 WORLD CHEMISTRY LEADERSHIP MEETING (WCLM) IN SAO PAULO, BRAZIL (2016-032-2-020) Ober		X
STRATEGIC PLANNING FOR A NETWORK FOR HETEROCYCLIC CHEMISTRY AMONG COUNTRIES OF THE MEDITERRANEAN, INCLUDING EUROPE AND NORTH AMERICA (2015-027-1-300) Florio - continuation of project (2011-006-2-300 see below)	X	
NOMENCLATURE OF HOMODECTIC CYCLIC PEPTIDES PRODUCED FROM RIBOSOMAL PRECURSORS (2015-003-2-300) Reaney	X	

HEALTHY LIFE AND ACTIVE AGEING: THE CONTRIBUTIONS OF FUNCTIONAL FOOD INGREDIENTS (2013-054-2-300) Rauter	X	
PHOTOLUMINESCENCE QUANTUM YIELDS (2013-040-1-300) Brouer – joint with Division I; this project was chaired by Enrique San Roman and Fred Brouwer and resulted in the publication of several very valuable documents on fluorescence standards and related matters.	X	
NOMENCLATURE OF PHOSPHORYL TRANSITION STATES (2013-039-2-300) Blackburn - A manuscript titled 'How to Name Atoms in Phosphates, Polyphosphates, their Analogues, and Transition State Analogues for Enzyme-catalysed Phosphoryl Transfer Reactions' is available as provisional recommendations.	X	
CARBOHYDRATE NOMENCLATURE (2012-039-2-800) Vliegenthart – joint with Division VIII and continued as project 2015-035-2-800.	X	
ABBREVIATIONS FOR PROTECTING GROUPS (2011-044-1-300) Brimble	X	
UPDATE OF IUPAC GLOSSARY OF PHYSICAL ORGANIC CHEMISTRY (2009-002-1-300) Perrin	X	
STANDARD PHOTOCHEMICAL PROCESSES (2008-037-2-300) Griesbeck	X	



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

### 18.4 Division IV Report to Council

Dr. Christine Luscombe

#### I. Highlights and/or Executive Summary:

Despite the pandemic, the Polymer Division continued to be productive in its activities. As ever, in 2020, new projects were started and old projects were finished. Most projects led to publications, which included recommendations. New members arrived with some old members taking more of a backseat. Virtual meetings took place and future meetings were planned.

Here are some of our key achievements.

- 20 publications including 8 in *Pure and Applied Chemistry* and 9 in *Chemistry Teacher International*
- 10 conferences endorsed although we did not receive applications for endorsement after March 2020 due to the pandemic – see Appendix IV
- Running 31 projects
- Completion of 4 projects; started 2 new projects
- While our flagship conference, Macro 2020, was postponed, Macro 2020+ is back stronger than ever with >1000 participants registered for our upcoming hybrid event to be held in Jeju, South Korea May 2021.
- Elected our first four Emeritus Fellows, Michael Buback, Richard Jones, Pavel Kratochvil, Jung-Il Jin, whose details were published in *Chemistry International* and on the [IUPAC website](#). Specifically, for Prof. Kratochvil, we were able to organize a special 90<sup>th</sup> birthday celebration, despite the pandemic, and present him with a special IUPAC plaque (see [CI Oct 2020](#), p. 48)
- Shorter but more frequent virtual meetings held by task groups to accommodate the virtual era with participants in different timezones.
- Creation of 3 new YouTube videos by Marloes Peeters – [How to get involved with IUPAC](#); [A tribute to the father of the soft contact lens: Prof Otto Wichterle](#); [100 years in polymer science](#)
- Establishment of IUPAC Polymer Division [Google Scholar](#) to better enable us to monitor our impact (Figure 1). We were pleasantly surprised to see that some of our recommendations are extremely widely cited. Downside of the use of Google Scholar is



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

that it has recognized that we are not an individual. As such, we do not appear in Google Scholar searches, nor does the page update itself with our papers. Specifically, it should be noted that not all of our publications from last year appear on the website.

- To celebrate the centenary of Macromolecular Science, an article has been written for *Chemistry International* and an article has been published in *Isr. J. Chem* (highlighted in last year's annual report).

As can be seen from the list above, the pandemic did not slow us down. We were determined to remain as productive as we could and fully embraced the virtual tools that were presented to us (Figure 2). One of the downsides of the pandemic is that it was challenging to develop new projects. However, the pandemic opportunity was that we were able to forge through with existing projects and tidy up loose ends. As a result, we currently have no overdue/overrunning projects.

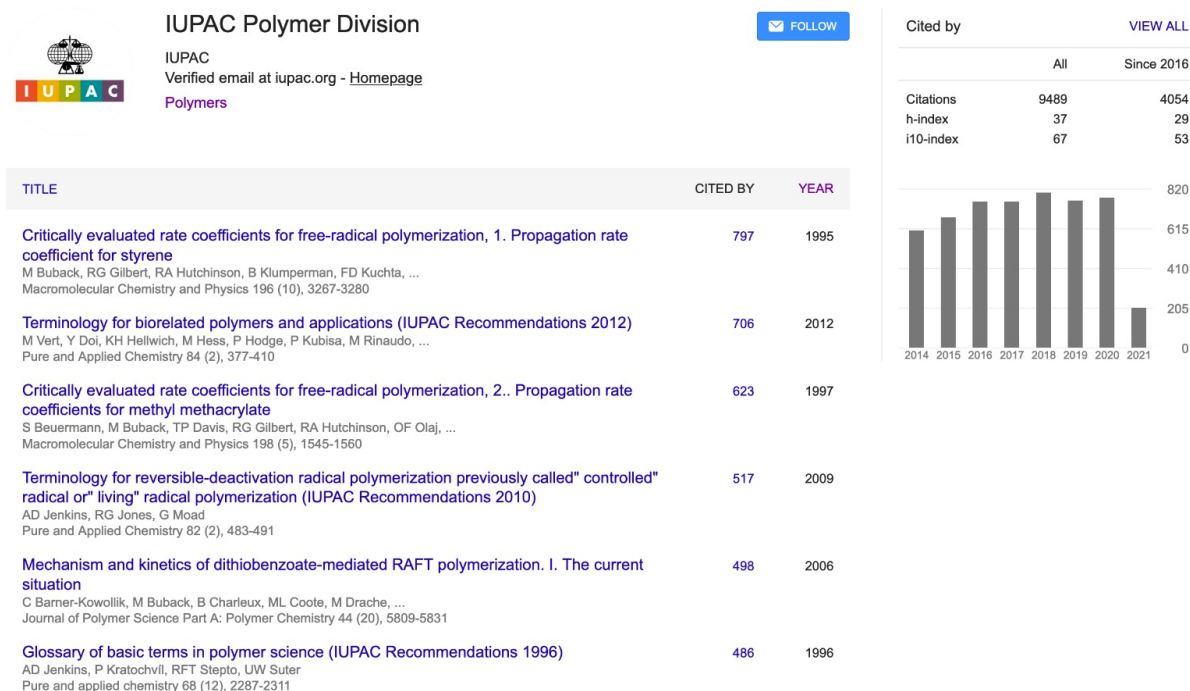
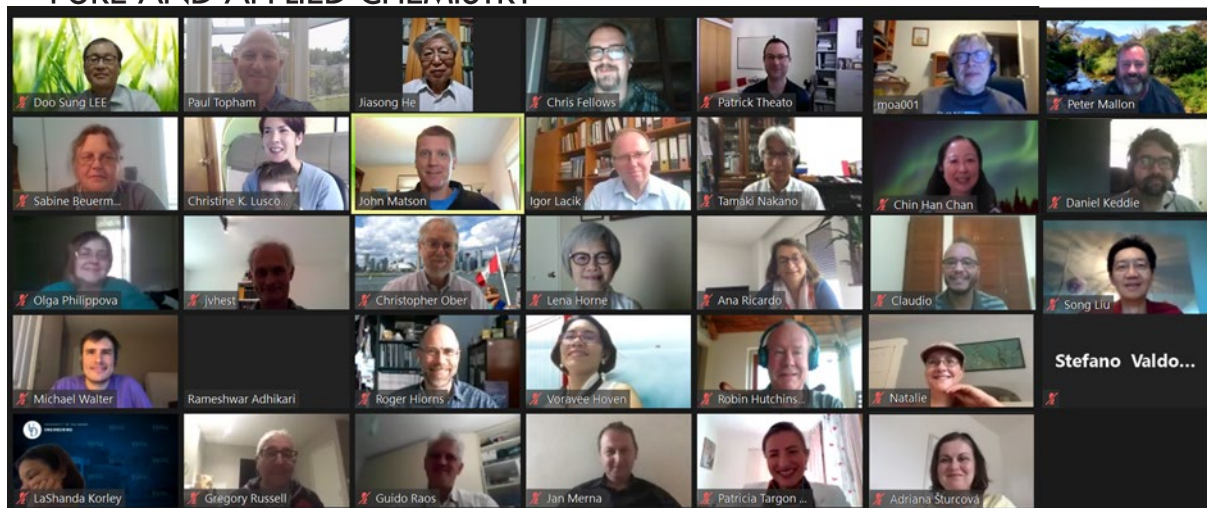


Figure 1. Screenshot of our Google Scholar page.



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY



*Figure 2. Screenshot of one of many zoom meetings that were held for our annual SPT/PD meetings in July 2020.*

## II. Plans and priorities for this biennium, and beyond:

**Project with OPCW:** Division IV is leading a project proposal with OPCW on PPEs. We will be working with Division V, VI, VII, ICGSD, and chemical education as well. Specifically, WHO modeling estimated a requirement of 89 million medical masks for the COVID-19 response each month and 76 million examination gloves, leading governments to increase the production of plastics by 40% to meet rising global demand. Besides for medical purpose, due to increase in demand for online food and groceries during the pandemic, common plastic packaging waste such as PP, HDPE, LDPE, PET, and PS has increased.

The pandemic has altered waste generation dynamics; it is also not unlikely that another such event will occur in the future. Therefore, we want this project to be forward-looking and develop recommendations for the future. This project will look into manners of reducing waste and plastic/environmental pollution, use of novel materials, and dealing with biohazards. We also expect that this project will directly link into ongoing work with OPCW, as they are also tasked with the clean-up of contaminated areas.

**Gold Book project:** Division IV is forging ahead with the Gold Book updates using a project that was officially started in 2019 (2019-043-2-400). Meetings have occurred with Stuart Chalk to ensure that best practices are followed to make this a priority project for us.



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**Wikipedia projects:** Our Wikipedia projects were placed on hold for some time as we ran into copyright issues. However, with the help of Stuart Chalk and Leah McEwen, we have been able to come up with a work around for the copyright issue and will be able to reinstate the project soon.

**Ensuring diversity within the Division:** Promoting diversity in all its forms remains a priority for us. We did a significant amount of outreach to try and ensure that a diverse group of scientists were nominated for the upcoming elections.

Please see the appendices below for each subcommittees reports.



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**Appendix I**

**Recent activities of the Polymer Division Subcommittee on Modeling of Polymerization Kinetics and Processes**

**Sabine Beuermann and Robin Hutchinson**

**March 2021**

**Objectives**

Modeling and mechanistic studies into free-radical polymerizations are important for science and industry, but often completely different model assumptions and parameter values are reported for ostensibly the same systems. The projects of the IUPAC Subcommittee “Modeling of Polymerization Kinetics and Processes” are to rectify this situation through international collaboration, by producing critically evaluated kinetic parameters, whose values are reliable and which can be used by the international polymer community. Reliable methodologies have been established by the IUPAC Subcommittee. Benchmark propagation rate coefficients,  $k_p$ , have been obtained for styrene, many methacrylates, butyl and methyl acrylate, vinyl acetate, and methacrylic acid by critical evaluation and also by independent experiments. These efforts were extended to termination rate coefficients, initiation rate parameters, and reversible-deactivation radical polymerization kinetics. Currently, the backbiting reaction in acrylate systems and the proper data evaluation in copolymerization are under consideration. In addition, a machine accessible databank for kinetic coefficients is being developed.

**Membership**

**Co-chairs:** S. Beuermann (Clausthal, D), R. A. Hutchinson (Kingston, CAN)

**Members:** C. Barner-Kowollik (Brisbane, AUS), M. Buback (Göttingen, D), M. Busch (Darmstadt TU, D), P. Castignolles (Western Sydney, AUS), M. Coote (Canberra, AUS), D. D’hooge (Ghent, BE), M. Drache (Clausthal, D), C. Fellows (Sydney, AUS), M. Gaborieau (Western Sydney, AUS), A. Goto (Kyoto, JP), M. Grady (Philadelphia, USA), Y. Guillaneuf (Marseille, FR), S. Harrisson (Toulouse, FR), A. M. van Herk (Singapore), J. P. A. Heuts (Eindhoven, NL), K. Hungenberg (Ludwigshafen, D), R. A. Hutchinson (Kingston, CAN), T. Junkers (Monash, AUS), A. Kajiwarra (Nara, JP), B. Klumperman (Stellenbosch, ZA), I. Lacík (Bratislava, SK), P. Lacroix-Desmazes (Montpellier, FR), J. R. Leiza (San Sebastián, ES), P. Lovell (Manchester, UK), K. Matyjaszewski (Pittsburgh, USA), G. Moad (Melbourne, AUS), M. Monteiro (Brisbane, AUS), D. Moscatelli (Milan, IT), A. N. Nikitin (Moscow, RUS), S. Perrier (Sydney, AUS), G. T. Russell (Christchurch, NZ), E. Sato (Osaka City, JPN), D. A. Shipp (Clarkson, USA), J.-P. Vairon (Paris, FR), H. Vale (Ludwigshafen, D), P. Vana (Göttingen, D),



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J. Vorholz (Darmstadt, D), E. B. Wysong (Wilmington, USA), S. Yamago (Kyoto, JP), P. B. Zetterlund (Sydney, AUS), S. Zhu (Hamilton, CAN)

[total of 42 members from 16 countries]

The subcommittee has not had any meetings in the past year, other than smaller meetings organized to discuss specific ongoing projects. The following technical report was written for Pure and Applied Chemistry in 2018, but was not issued until November 2019.

*"Critically evaluated propagation rate coefficients for radical polymerizations: acrylates and vinyl acetate in bulk (IUPAC Technical Report)", R. A. Hutchinson, S. Beuermann, Pure Appl. Chem. 91(11), 1883–1888 (2019)*

No projects were completed since the start of 2019. Ongoing projects include:

1. Development of a Machine Accessible Kinetic Databank for Radical Polymerizations (Project 2019-045-1-400, T. Junkers)
2. Experimental methods and data evaluation procedures for the determination of radical copolymerization reactivity ratios (Project 2019-023-1-400, A. M. van Herk)
3. Critically evaluated rate coefficients for backbiting in acrylate radical polymerization (Project 2017-028-1-400, R. A. Hutchinson, T. Junkers)
4. Critically Evaluated Rate Coefficients for Radical Polymerizations of Styrene (Project 2013–047–1–400, leadership changed to K.-D. Hungenberg)
5. Critically Evaluated ESR (EPR) Spectra of Important Polymerization-Related Radicals (Project 2015–047–1–400, A. Kajiwarra).
6. Critically Evaluated Rate Parameters for Chain-length-Dependent Termination Kinetics in Radical Polymerization of Styrene and Methyl Methacrylate (Project 2013–051–1–400, G. T. Russell)

### **Interdivisional project:**

7. Guidance for the Compilation, Critical Evaluation and Dissemination of Chemical Data (Project 2018-009-2-500, D. Shaw) R. A. Hutchinson participates as representative from this Subcommittee



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**Appendix II**

**Annual Report of IUPAC Subcommittee on Polymer Education - 2020**

**Goals**

The Subcommittee on Polymer Education was established in 2005 to bring existing educational activities under one roof and to emphasize both the importance of polymer education and the dedication of the IUPAC Polymer Division to this important field.

**Objectives**

The Subcommittee supports recurrent educational activities for polymer students from less-developed countries; it organizes educational sessions within the framework of the IUPAC Macro World Polymer Congress series and maintains the IUPAC Polymer Education Website.

**Summary of key activities from the second half of 2019-end of 2020**

2019-035-1-050	Special issue of Chemistry Teacher International in Polymer Sciences
2019-022-1-400	Educational Workshop in Polymer Sciences 2020
2018-038-1-400	Hands-on training on Wikipedia and Wikidata for application of IUPAC terms across Wikipedia
2017-019-2-400	An International Exercise-Based Syllabus in Polymer Chemistry
2015-032-2-400	Synchronizing Wikipedia: Polymer Definitions and Terminology
2012-027-3-400	Enhancing Educational Website for Polymer Chemistry

**Summary of status of each project**

The Subcommittee on Polymer Education has seven current projects.

**2019-035-1-050                      Special issue of Chemistry Teacher International in Polymer Sciences**

A join project with the Committee on Chemical Education, this involves pairing academics in chemical education with researchers in polymer science to produce a special issue of the journal 'Chemistry Teacher International' (itself an IUPAC project, 2016-002-4-050) based on the content of educational workshops (2016, 2017, 2018 and 2020+) delivered at polymer conferences as part of other IUPAC projects (2015-057-1-400, 2016-033-1-400, 2017-029-2-400, 2019-022-1-400). The publication of the lecture notes covering topics of polymer synthesis



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(3 articles), polymer characterization (5 articles), polymer processing (2 articles) and polymer applications and others (3 articles).

### **2019-022-1-400**

#### **Educational Workshop in Polymer Sciences 2020+**

Following up on successful workshops held earlier at the MACRO 2018 meeting in Cairns (2017-029-2-400), the POLYCHAR meeting in Kuala Lumpur (2015-057-1-400) and the MACRO 2016 meeting in Istanbul (2015-057-1-400), it was planned to have a half-day educational workshop with a primary audience of postgraduate students at MACRO 2020 on Jeju. This workshop was rescheduled to 2021.

### **2018-038-1-400**

#### **Hands-on training on Wikipedia and Wikidata for application of IUPAC terms across Wikipedia**

A successful week of training was carried out in Milan with updates to 50+ polymer related pages on Wikipedia and work done with the aim of making the Polymer article a 'feature' article. A third edition of the course has been approved and funded by the PhD School of the Politecnico di Milano, and was held in Milano in 2019. Members of the task group learned more in-depth about Wikipedia and Wikidata, and will apply this to the creation/editing of a few high-quality Wikipedia pages on polymer-related subjects.

### **2017-019-2-400**

#### **An International Exercise-Based Syllabus in Polymer Chemistry**

Intended to create a resource for teachers and students in less developed countries, providing the 'skeleton' of a textbook with enough exercises to support an undergraduate course of study in polymer chemistry. A first draft of the syllabus is very close to completion.

### **2015-032-2-400**

#### **Synchronizing Wikipedia: Polymer Definitions and Terminology**

This project led over the past few years to numerous new and updated polymer-related Wikipedia pages containing IUPAC definitions and the follow up project 2018-038-1-400. The work is temporarily at a stop point as of July 2020.

### **2012-027-3-400**

#### **Enhancing Educational Website for Polymer Chemistry**

Dec 2019 update – The project was a major topic of discussion at the last meeting of the Subcommittee on Polymer Education in Paris and the task group plans to expand the site scope by providing an understanding of polymers and best methods for communication, aimed at students, educators, and the public.

Dec 2020 update – Dr Marloes Peeters -a former IUPAC Young Observer- contributed 3 videos.

- (1) she explains how she became involved in the IUPAC Polymer Division and her experiences with the wide range of activities with which IUPAC is involved.



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- (2) she retraces a brisk journey through the past, present, and future of synthetic polymers ('plastics').
- (3) she presents the story of the discovery by Otto Wichterle and Drahoslav Lim of poly(hydroxyethyl methacrylate) hydrogels and their use in making the first soft contact lenses.

### List of publications since second half of 2019

- (1) Penczek, S.; Pretula, J.; Slomkowski, S. Ring-opening polymerization. *Chemistry Teacher International* **2021**, doi:10.1515/cti-2020-0028
- (2) Halim, S. I. A.; Chan, C. H.; Apotheker, J. Basics of teaching electrochemical impedance spectroscopy of electrolytes for ion-rechargeable batteries – part 1: A good practice on estimation of bulk resistance of solid polymer electrolytes. *Chemistry Teacher International* **2021**, 10.1515/cti-2020-0011, 1-11, doi:10.1515/cti-2020-0011.
- (3) Luscombe, C. K.; Maitra, U.; Walter, M.; Wiedmer, S. K. Theoretical background on semiconducting polymers and their applications to OSCs and OLEDs. *Chemistry Teacher International* **2021**, 10.1515/cti-2020-0020, doi:10.1515/cti-2020-0020.
- (4) Bagheri, A.; Boniface, S.; Fellows, C. M. Reversible-Deactivation Radical Polymerisation: chain polymerisation made simple. *Chemistry Teacher International* **2021**, 10.1515/cti-2020-0025, doi:10.1515/cti-2020-0025.
- (5) Abetz, V.; Brinkmann, T.; Sözbilir, M. Fabrication and function of polymer membranes. *Chemistry Teacher International* **2021**, 10.1515/cti-2020-0023,
- (6) Moad, C. L.; Moad, G. Fundamentals of reversible addition–fragmentation chain transfer (RAFT). *Chemistry Teacher International* **2020**, 10.1515/cti-2020-0026, doi:10.1515/cti-2020-0026.
- (7) Vohlídal, J. Polymer degradation: a short review. *Chemistry Teacher International* **2020**, 10.1515/cti-2020-0015, doi:10.1515/cti-2020-0015.
- (8) Zainal, N. F. A.; Saiter, J. M.; Halim, S. I. A.; Lucas, R.; Chan, C. H. Thermal analysis: Basic concept of differential scanning calorimetry and thermogravimetry for beginners. *Chemistry Teacher International* **2020**, 10.1515/cti-2020-0010, 20200010, doi:10.1515/cti-2020-0010.
- (9) Nakano, T.; Pietropaolo, A.; Kamata, M. Chirality analysis of helical polymers. *Chemistry Teacher International* **2020**, 10.1515/cti-2020-0009, doi:10.1515/cti-2020-0009.



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The Chair of the Subcommittee is Chris Fellows (The University of New England, Australia - [cfellows@une.edu.au](mailto:cfellows@une.edu.au)) and the Secretary is Melissa Chin Han Chan (Universiti Teknologi MARA, Malaysia - [cchan\\_25@yahoo.com.sg](mailto:cchan_25@yahoo.com.sg)). There are 28 other members of the Subcommittee, representing Australia, Brazil, China (Beijing), China (Taipei), Czech Republic, Germany, Italy, Japan, Korea, Nepal, New Zealand, Qatar, Russia, South Africa, United Kingdom, and United States of America. Bimonthly Zoom meetings of the Subcommittee have been well attended over the past year, with almost all members attending at least one meeting.



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**Appendix III**

**Report from Subcommittee on Structure and Properties of Commercial Polymers**

Our subcommittee focuses on accumulating knowledge of structure and properties (mostly rheology and mechanical properties) of commercial polymers. With a balanced industry and academia memberships we are able to identify relevant challenges met in industry and to provide key solutions that will be beneficial for future materials development.

Due to the Covid-19 pandemic, we did not meet in person in the year 2020. Instead, we held an online subcommittee East Asian meeting on 20 Nov. 2020 with few scientific talks listed below. A total of 22 members from 4 countries participated the meeting. We discussed general matters of the subcommittee including results of projects (officially terminated

But yet active), feasibility studies of new proposals and so one.

Presentations (each 30 minutes: a talk of 25 min plus 5 min for discussions):

1. Prof. Chang-Sik Ha (Pusan National University), “Toughening poly(lactic acid) through reactive blending.”
2. Prof. Koh-hei Nitta (Kanazawa University), “Mechanical relaxation in polyethylene/paraffin mixtures”
3. Prof. Xia Dong (Institute of Chemistry, Chinese Academy of Sciences), “Long Chain Aliphatic Polyamides”
4. Prof. Prof. Andrzej Galeski (Polish Academy of Sciences), “UHMWPE data from European branch of IUPAC”

The list below summarizes publications from our subcommittee in year 2020:

1. Clive Bucknall, Volker Altstädt, Dietmar Auhl, Paul Buckley, Dirk Dijkstra, Andrzej Galeski, Christoph Gögelein, Ulrich A. Handge, Jiasong He, Chen-Yang Liu, Goerg Michler, Ewa Piorkowska, Miroslav Slouf, Iakovos Vittorias and Jun Jie Wu “[Structure, processing and performance of ultra-high molecular weight polyethylene \(IUPAC Technical Report\). Part 1: characterizing molecular weight](#)” Pure Appl. Chem. 2020; 92(9): 1469–1483
2. Clive Bucknall, Volker Altstädt, Dietmar Auhl, Paul Buckley, Dirk Dijkstra, Andrzej Galeski, Christoph Gögelein, Ulrich A. Handge, Jiasong He, Chen-Yang Liu, Goerg Michler, Ewa Piorkowska, Miroslav Slouf, Iakovos Vittorias and Jun Jie Wu “[Structure, processing and performance of ultra-high molecular weight polyethylene \(IUPAC Technical Report\). Part 2: crystallinity and supra molecular structure](#)” Pure Appl. Chem. 2020; 92(9): 1485–1501



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3. Clive Bucknall, Volker Altstädt, Dietmar Auhl, Paul Buckley, Dirk Dijkstra, Andrzej Galeski, Christoph Gögelein, Ulrich A. Handge, Jiasong He, Chen-Yang Liu, Goerg Michler, Ewa Piorkowska, Miroslav Slouf, Iakovos Vittorias and Jun Jie Wu “[Structure, processing and performance of ultra-high molecular weight polyethylene \(IUPAC Technical Report\). Part 3: deformation, wear and fracture](#)” Pure Appl. Chem. 2020; 92(9): 1503–1519
4. Clive Bucknall, Volker Altstädt, Dietmar Auhl, Paul Buckley, Dirk Dijkstra, Andrzej Galeski, Christoph Gögelein, Ulrich A. Handge, Jiasong He, Chen-Yang Liu, Goerg Michler, Ewa Piorkowska, Miroslav Slouf, Iakovos Vittorias and Jun Jie Wu “[Structure, processing and performance of ultra-high molecular weight polyethylene \(IUPAC Technical Report\). Part 4: sporadic fatigue crack propagation](#)” Pure Appl. Chem. 2020; 92(9): 1521–1536
5. Andrzej Galeski, Zbigniew Bartczak, Alina Vozniak, Andrzej Pawlak, and Rainer Walkenhorst "Morphology and Plastic Yielding of Ultrahigh Molecular Weight Polyethylene" Macromolecules 2020, 53, 6063–6077.
6. Ying Lu, Dong Lyu, Yujing Tang, Li Qian, Yanan Qin, Mingyue Xiang, Yongfeng Men "Effect of  $\alpha$ c-relaxation on the large strain cavitation in polyethylene" Polymer, 2020, 210, 123049.
7. Ruihua Lv, Yucheng He, Kefeng Xie and Wenbing Hu “Crystallization rates of moderate and ultrahigh molecular weight polyethylene characterized by Flash DSC measurement” Polym Int 2020; 69: 18–23.



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**Appendix IV**

**Report on conferences endorsed by PD IUPAC in 6/2019 - 3/2021**

**Igor Lacík, March 5, 2021**

The current situation has been heavily influenced by the COVID-19 pandemic; since it started (March 2020), no new Applications for IUPAC Endorsement has been filed.

Below is the list of Applications for IUPAC Endorsement reviewed in 2019 and 2020. They are either on hold or planned as virtual or hybrid events:

1. IUPAC Macro 2020+ 48th World Polymer Congress, May 16 – 20 2021, ICC Jeju, Korea (<http://www.macro2020.org/sub/catalog.php?CatNo=8>)
2. 23rd International Conference on Phosphorus Chemistry (ICPC23), May 31 - June 4 2020, Ningbo, China (<http://www.icpc23.org/>); the conference has been postponed to 2023 due to COVID-19
3. 44th International Conference on Coordination Chemistry (ICCC 2020), July 5 – 10 2020, Rimini, Italy (<https://www.iccc2020.com/>); the conference has been postponed to 28 Aug – 2 Sept 2022 due to COVID-19
4. 6<sup>th</sup> European Symposium on Photopolymer Science, 6-9 September 2020, Istanbul, Turkey (<http://www.esps2020.org/>); the conference has been postponed to Spring or Autumn 2022 due to COVID-19
5. IUPAC Macro 2022 49th World Polymer Congress, July 17 – 22 2022, Winnipeg, Manitoba, Canada (<https://iupac.org/event/48th-world-polymer-congress-macro2020/>)
6. 10<sup>th</sup> International Symposium “Molecular Order and Mobility in Polymer Systems”, 18-22 05 2020, Saint-Petersburg, Russia (<https://iupac.org/event/10th-international-symposium-on-molecular-order-and-mobility-in-polymer-systems/>); the conference has been postponed to May-June 2021 due to COVID-19
7. Polymers 2020: New Trends in Polymer Science: Health of the Planet, Health of the People, June 3–5 2020, Turin, Italy (<https://polymers2020.sciforum.net/>); the conference has been postponed to 25-27 May 2022 due to COVID-19



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8. 13th Conference on Polymer-Solvent Complexes and Intercalates, November 10-13 2020, Toyonaka, Japan, (<http://www.chem.sci.osaka.ac.jp/graduate/mms/polysolvat13/>); the conference has been postponed to the autumn 2021 due to COVID-19
9. Italian-French International Conference on Magnetic Resonance, September 21-24 2020, Milan, Italy (<https://iupac.org/event/italian-french-international-conference-on-magnetic-resonance/>); the conference has been postponed to September 2021 due to COVID-19
10. POLY-CHAR 2021 World Forum on Advanced Materials and Short Course on Polymer Characterization, January 25 – 29 2021, Auckland, New Zealand; the conference has been postponed to 17-20 January 2022 due to COVID-19



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**Appendix V**

**IUPAC POLYMER DIVISION (IV)**

**Report on Subcommittee on Polymer Terminology (SPT) for the Year to March 2021**

The 2020 meeting of the Subcommittee was held between the 29<sup>th</sup> of June and 2<sup>nd</sup> of July in an online format. Despite the challenges of holding the meeting online due to the ongoing COVID-19 pandemic, the meeting was very well attended. Around 46 members were present during the several days of the meeting. The following members and observers participated: Prof. Volker Abetz (VA, Germany), Dr. Rameshwar Adhikari (RA, Nepal), Prof. Blair Brettmann (BB, USA), Prof. Patricia Targon Campana (PTC, Brasil, Observer), Prof. Melissa Chan (MC, Malaysia), Mr. Jiazhong Chen (JC, USA), Prof. Wesley S. Farrell (WF, USA), Prof. Chris Fellows (CF, Australia), Dr. Francesca Giuntini (FG, UK), Prof. Monika Gosecka (MG, CZ, Observer) Prof. Carlos F. O. Graeff (CG, Brazil), Dr. Daniebelle Haase (DH, USA), Prof. Jiasong He (JH, China/Beijing), Prof. Michael Hess (MH, Germany), Dr. Roger C. Hiorns (RCH, France - Chair), Prof. Lena Horne (LH, Canada), Prof. Wenbing Hu (WH, China/Beijing) Prof. Richard “Dick” Jones (RGJ, UK), Dr. Daniel Keddie (DK, UK), Prof. LaShanda Korley (LK, USA), Prof. Christine Luscombe (CKL, USA), Dr. Mario Malinconico (MM, Italy), Prof. Peter Mallon (PM, South Africa), Prof. John B. Matson (JBM, USA - Secretary), Prof. Stefano Valdo Meille (SVM, Italy), Dr. Jan Merna (JM, Czech Republic), Dr. Yoko Miyasaka (YM, Japan, Observer), Dr. Graeme Moad (GM, Australia), Prof. Tamaki Nakano (TN, Japan), Prof. Chris Ober (CO, USA), Dr. Marloes Peeters (MP, UK), Prof. Stan Penczek (SP, Poland), Prof. Olga Philippova (OP, Russia), Prof. Guido Raos (GR, Italy), Prof. Greg Russell (GTR, New Zealand), Prof. Cláudio dos Santos (CdS, Brazil), Prof. Stan Slomkowski (SS, Czech Republic), Prof. Natalie Stingelin (NS, UK), Dr. Adriana Sturcova (AS, Czech Republic), Prof. Patrick Théato (PT, Germany - Secretary), Prof. Paul D. Topham (PDT, UK), Dr. Lydia Sosa Vargas (LSV, France), Prof. Jiri Vohlidal (JV, Czech Republic), Prof. Michael Walter (MGW, USA), Dr. Andrey Yerin (AY, Russia), Prof. Myung-Han Yoon (MHY, Korea). Apologies were received from Prof. J.-L. Gardette (JLG, France) and Prof. Michel Vert (MV, France).

The SPT website has been continually updated, and the minutes of past meetings are rapidly published at:

[https://iupac.org/who-we-are/committees/committee-details/?body\\_code=401](https://iupac.org/who-we-are/committees/committee-details/?body_code=401)

The minutes of the 2020 SPT meetings have been circulated and are pending SPT approval (see attachment).



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The role of SPT is to produce documents that define terms in polymer science and to make recommendations on the nomenclature of polymers on behalf of Division VIII. Its work is used greatly throughout academia, secondary and tertiary educational institutes, and perhaps most importantly in industry.

Many projects have been progressed throughout the year by electronic exchanges using e-mail and Skype or similar video call technologies. Yet, it is the understanding of SPT that face-to-face meetings are very important, as they allow projects to advance much more quickly than by electronic communications alone. The process of in-depth discussion and debate between the members and observers is intrinsic to developing viable, useful systems of terminology and nomenclature. Further, integration of observers is most effective during face-to-face meetings. Having that said, the COVID-19 pandemic has impacted our work, as it was impossible for us to meet in 2020 in Jeju. The decision was made to hold the SPT meeting completely online, and progress on projects was good, despite the challenges to cope with different time zones to bring members from different countries together. As such, face-to-face meetings are much more efficient, when all members are present in one location. It is therefore very much hoped that future meetings will occur again in person, so that we can rapidly advance our work. That said, warm thanks to our members and team leaders, who have been exceptional in driving forward projects as far as they can electronically, often under difficult personal circumstances.

Nevertheless, the decision has been made that the 2021 SPT meeting in August will be held online again, due to the uncertainty in the ongoing COVID-19 pandemic. Details of the agenda are currently under development.

## PROJECTS

In the period covered by this report, the Subcommittee has worked on 26 projects, of which five projects (Alain Fradet (Dendritic), Stan Slomkoski (Keywords), Michel Vert (Lactic), Phil Hodge (Web-Guide), Jiazhong Chen (Stars1)) have been concluded successfully. Another four projects are in earnest preparation for submission for funding.

The five finished projects, producing documents now published, and detailed below, give good examples of the range of our work. Three papers were published on the terminology and nomenclature of polymers. Two other papers show our work in helping the polymer communities publish their work, one being on keyword listings and another guiding authors so that IUPAC terminology and nomenclature is more accessible.

This considerable level of activity also meant that we were starting to come close to not having enough projects to work on! We are particularly grateful to the new president, Christine Luscombe, for her strong support of new projects that were submitted this year. Additionally, all task group leaders should be managing their projects effectively during the current pandemic.



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The new projects (Electro, Nano-nano, DE, and Brief Guide Revision) are very important for the polymer community.

Here is the list of SPT projects:

### 1. The following projects delivered the following publications or have been accepted for publication:

- **2001-081-1-800 (DENDRITIC, Fradet)** ‘Terminology and structure-based nomenclature of dendritic and hyperbranched polymers (IUPAC Recommendations 2017)’, A. Fradet,\* J. Chen, K.-H. Hellwich, K. Horie, J. Kahovec, W. Mormann, R. F. T. Stepto, J. Vohlidal, E. S. Wilks, *Pure & Appl. Chem.*, **2019**, 91(3), 523-561. <https://doi.org/10.1515/pac-2016-1217>
- **2010-036-1-400 (KEYWORDS, Slomkowski)** ‘List of keywords for polymer science (IUPAC Technical Report)’, S. Slomkowski,\* C. M. Fellows, R. C. Hiorns, R. G. Jones, P. Kubisa, C. K. Luscombe, T. Nakano, G. T. Russell, C. G. dos Santos, C. Scholz, N. Stingelin, M. G. Walter, *Pure & Appl. Chem.*, **2019**; 91(6):997-1027. <https://doi.org/10.1515/pac-2018-0917>
- **2014-033-1-400 (LACTIC, Vert)** ‘Nomenclature and terminology for linear lactic acid-based polymers (IUPAC Recommendations 2019)’ M. Vert,\* J. Chen, K.-H. Hellwich, P. Hodge, T. Nakano, C. Scholz, S. Slomkowski, J. Vohlidal, *Pure & Appl. Chem.*, **2020**; 92(1):193-211; <https://doi.org/10.1515/pac-2017-1007>
- **2008-020-1-400 (WEB-GUIDE, Hodge)** ‘A concise guide to polymer nomenclature for authors of papers and reports in polymer science and technology (IUPAC Technical Report)’, P. Hodge\*, K. -H. Hellwich, R. C. Hiorns, R. G. Jones, J. Kahovec, C. K. Luscombe, M. D. Purbrick and E. S. Wilks, *Pure Appl. Chem.* 2020; 92(5): 797–813; <https://doi.org/10.1515/pac-2018-0602>
- **2013-031-3-800 (STAR)** ‘Structure-based nomenclature for irregular linear, star, comb and brush polymers (IUPAC Provisional Recommendations)’, J. Chen\*, E. S. Wilks\*, A. Fradet, K.-H. Hellwich, R. C. Hiorns, T. Nakano, C. G. dos Santos, P. Theato, *PAC-REC-2020-0103.R2 accepted*.

### 2. The following projects are currently in public review:

- **2009-047-1-400 (STEREOCHEM)** *Definitions and notations relating to stereochemical aspects in polymer science* – Hellwich & Moad



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- **2012-001-1-400** (NANO-LITHO) *Terminology of nanomaterials and nanotechnology in polymer science*, Ober & Jones through the document, *Terminology of Polymers in Advanced Lithography*
- **2014-034-2-400** (CAR) *Nomenclature for polymeric carriers bearing chemical entities with specific activities and names* – Vert
- **2006-028-1-400** (FIELD) *Terminology for conducting, electro-active and field-responsive polymers* – Vohlidal
- **2010-007-1-400** (CHAIN) *Terminology for chain polymerization* – Luscombe & Moad

### 3. The following projects are working:

- **2012-048-3-400** (B-TERMS) *A brief guide to polymer terminology* – Hiorns & Vohlidal
- **2011-035-1-800** (TINCOPS) *Terminology and nomenclature of inorganic and coordination polymers – a extended revision of Nomenclature for regular single-strand and quasi-single-strand inorganic and coordination polymers (1984)\** - Jones
- **2014-014-1-400** (MODSIM) *Terminology for Modeling and Simulation of Polymers* - Meille
- **2015-013-1-400** (POLY) *Brief Guide to Polymerization Terminology* – Luscombe
- **2015-014-1-400** (SEMIS) *Guide (and Brief Guide) to Polymer Semiconductors* – Walter
- **2015-032-2-400** (WIKI) *Synchronizing Wikipedia: Polymer Definitions and Terminology* – Hess
- **2015-049-1-400** (CHAR) *Brief Guide to the Characterisation of Polymers* – Topham
- **2015-050-1-400** (ULTIMATE) *Definition of Terms Relating to the Ultimate Mechanical Properties of Polymers* – Adhikari
- **2016-050-3-400** ( $\mu$ STRUCTURE) *Definition of Terms Pertaining to Polymers in the Solid State: Molecular Arrangement from the Nano- to the Micrometer Scale* - Stingelin
- **2017-039-2-800** (GRAPHIC) *Graphical Representation of Polymer Structures* – Hellwich
- **2018-033-1-400** (ADDIPLAST) *Additives intended to promote the degradation of polyolefin-based thermoplastic materials* – Malinconico
- **2019-041-3-400** (SEQ) *Nomenclature of Sequence-Controlled Polymers* – Théato



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- **2019-043-1-400 (GOLDEN)** Gold Book Updates for Polymers - dos Santos
- **2019-010-2-400 (AGGREGATES)** Terminology of Polymer Aggregates – Nakano
- **2019-027-1-400 (OVER)** Basic classification and definitions of polymerization reactions - Matson

**4. The following projects have recently been accorded funding or extension or both:**

- **2019-036-1-800 (STARS2)** Structure-based nomenclature for irregular linear, star, comb and brush polymers with different types of constitutional repeating units (CRU) – Chen

**5. Projects submitted or close to submission to IUPAC for funding:**

- **2020-XXX-X (ELECTRO)** Electronic Formulae – Yerin
- **2020-XXX-X (Nano-Nano)** Yoon & Jones
- **2020-XXX-X** Revision of the Brief Guide to Polymer Nomenclature - **Hiorns**, Boucher, Chen, Duhlev, Fradet, Hellwich, Jones, Nakano, Vert
- **2020-XXX-X (DE)** Degradation of polymers – Gardette
- **2021-XXX-X (UNITED)** – Patricia
- **2021-XXX-X (SUPRA)** - Monika

30.03.2021

John B. Matson, Patrick Theato

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\* Division VIII project pursued under the auspices of SPT.

April 6, 2021

IUPAC DivV report to the Council

By Zoltan Mester, DivV President

### **Division V Vision:**

Division V provides objective scientific expertise and develops essential tools of analytical chemistry that enable IUPAC to accomplish its mission in sustainable development, creating and promoting a common language, providing evaluated data and advocating free scientific exchange, in collaboration with others.

### **Division V Goals:**

- Provide the highest level of unbiased analytical chemical science expertise
  - Publishing technical reports
  - Publishing recommendations on terminology
  - Evaluating of chemical data
  - Making its products available in modern digital forms
  - Contributing to international standard development
  - Providing scientific expertise and advice to relevant international organizations
  
- Promote and foster the growth of analytical chemistry as a scientific discipline
  - Reinforcing divisional relationships with other IUPAC bodies
  - Organizing / sponsoring international scientific events
  - Contribute to issues related to analytical chemistry education
  - Awarding outstanding contributions towards IUPAC Analytical Chemistry Division's vision
  
- Ensure the vitality of the Division
  - Evaluating Divisional outputs and setting associated targets
  - Engaging with stakeholder communities that can benefit from, and contribute to, the work of the division
  - Leveraging external resources to enhance divisional activities

## Technical reports and recommendations published in 2020-2021

Takeuchi, Takae, McQuillan, A. James, Shard, Alexander, Russell, Andrea E. and Hibbert, D. Brynn. "Glossary of methods and terms used in surface chemical analysis (IUPAC Recommendations 2020)" *Pure and Applied Chemistry*, vol. 92, no. 11, 2020, pp. 1781-1860. <https://doi.org/10.1515/pac-2019-0404>

Kuselman, Ilya, Pennechi, Francesca R., da Silva, Ricardo J. N. B. and Hibbert, David Brynn. "IUPAC/CITAC Guide: Evaluation of risks of false decisions in conformity assessment of a multicomponent material or object due to measurement uncertainty (IUPAC Technical Report)" *Pure and Applied Chemistry*, vol. 93, no. 1, 2021, pp. 113-154. <https://doi.org/10.1515/pac-2019-0906>

Chai, Zhifang, Chatt, Amares, Bode, Peter, Kučera, Jan, Greenberg, Robert and Hibbert, David B.. "Vocabulary of radioanalytical methods (IUPAC Recommendations 2020)" *Pure and Applied Chemistry*, vol. 93, no. 1, 2021, pp. 69-111. <https://doi.org/10.1515/pac-2019-0302>

Pingarrón, José M., Labuda, Ján, Barek, Jiří, Brett, Christopher M. A., Camões, Maria Filomena, Fojta, Miroslav and Hibbert, D. Brynn. "Terminology of electrochemical methods of analysis (IUPAC Recommendations 2019)" *Pure and Applied Chemistry*, vol. 92, no. 4, 2020, pp. 641-694. <https://doi.org/10.1515/pac-2018-0109>

Labuda, Ján / Bowater, Richard P. / Fojta, Miroslav / Gauglitz, Günter / Glatz, Zdeněk / Hapala, Ivan / Havliš, Jan / Kilar, Ferenc / Kilar, Aniko / Malinovská, Lenka / Sirén, Heli M. M. / Skládal, Petr / Torta, Federico / Valachovič, Martin / Wimmerová, Michaela / Zdráhal, Zbyněk / Hibbert, David Brynn

[Terminology of bioanalytical methods \(IUPAC Recommendations 2018\)](#)  
*Pure and Applied Chemistry*, Volume 90, Issue 7. Pages 1121-1198

Camões, Maria F. / Christian, Gary D. / Hibbert, David Brynn  
[Mass and volume in analytical chemistry \(IUPAC Technical Report\)](#)  
*Pure and Applied Chemistry*, Volume 90, Issue 3. Pages 563-603

Maryutina, Tatiana A. / Savonina, Elena Yu. / Fedotov, Petr S. / Smith, Roger M. / Siren, Heli / Hibbert, D. Brynn  
[Terminology of separation methods \(IUPAC Recommendations 2017\)](#)  
*Pure and Applied Chemistry*, Volume 90, Issue 1. Pages 181-231

Marquardt, Roberto / Meija, Juris / Mester, Zoltán / Towns, Marcy / Weir, Ron / Davis, Richard / Stohner, Jürgen

[Definition of the mole \(IUPAC Recommendation 2017\)](#)

Pure and Applied Chemistry, Volume 90, Issue 1. Pages 175-180

Possolo, Antonio / van der Veen, Adriaan M. H. / Meija, Juris / Hibbert, D. Brynn

[Interpreting and propagating the uncertainty of the standard atomic weights \(IUPAC Technical Report\)](#)

Pure and Applied Chemistry, Volume 0, Issue 0. Pages –

## **Evaluating of chemical data**

## **Making its products available in modern digital forms**

Div V operates two subcommittees dedicated exclusively to chemical data evaluation. Detailed descriptions and latest updates could be found under the links below

- [Subcommittee on Solubility and Equilibrium Data](#)
- [Interdivisional Subcommittee on Critical Evaluation of Data](#)

## **Contributing to international standard development**

## **Providing scientific expertise and advice to relevant international organizations**

Division V contributes to standardization efforts world wide specifically:

International Committee on Weights and Measures/Consultative Committee on the Amount of Substance (CIPM/CCQM)

ISO-Committee on Reference Materials (ISO/REMCO)

CITAC

Joint Committee for Guides in Metrology (JCGM)

EuChemS (European Chemical Society)

EURACHEM

CODATA

## **Organizing / sponsoring international scientific events**

Div V has sponsored/co-organized two scientific conferences in the analytical chemistry domain.

Colloquium Spectroscopicum Internationale XLI (CSIXLI) and first Latin-American Meeting on Laser Induced Breakdown Spectroscopy was held in Mexico City in June 2019 with IUPAC presentation in keynote lecture format.

15th Rio Symposium on Atomic Spectrometry, Mendoza, October 2019, high profile conference  
300+ attendants  
<https://www.15riosymposium.com/>

## **Contribute to issues related to analytical chemistry education**

Because of the perceived loss of knowledge, research and teaching capacity in the analytical chemistry domain Div V has launched a major project on documenting and current status of analytical chemistry education world wide, along with a needs analysis from educators, students and industry

Project # 2019-039-3-500

A Review of Current Status of Analytical Chemistry Education There is plenty of anecdotal evidence for the erosion of analytical chemistry as a discipline. This is impacted by faculty appointments, funding structures and perception of the field as being a service function. Additionally, as instruments become easier to use there is a mistaken belief in some industrial organisations that there is a reduced need for highly trained analytical specialists. There have been warning signs that the current, university chemistry curriculum, often with a does not address the needs of chemistry graduates and future employers and does not enable analytical practitioners to maximise the value of their work. The project will reflect on the interdisciplinary curriculum development efforts which has been the trend in many universities worldwide. This is a significant economic cost, considering that in many economies the most used practical skills of graduates is actually related to chemical analysis. A deep and fundamental understanding of analytical chemistry is required to foster the next generation of analytical scientists who have the insight and capacity to contribute to fundamental new developments in this field as well as the generation of new disruptive technologies.

The project will document the status quo in various regions of the world regarding the health of the discipline, proportion of professorships, funding and quality of analytical chemistry

## **Awarding outstanding contributions towards IUPAC Analytical Chemistry Division's vision**

Analytical Chemistry had no high profile international prize. Division V has decided to create one along with an early career innovation award.

The first round of nomination and review process was completed and in 2021 we will be naming the first recipients of this award

## **Engaging with stakeholder communities that can benefit from, and contribute to, the work of the division**

### **Leveraging external resources to enhance divisional activities**

Analytical industry is not present at IUPAC at any level. The division has started a planning and outreach and establishing an industry sub group within the division to provide a space for industry input. Also it is expected this group would take a leading role in driving non academic project development / selection and funding process. It is expected that by Montreal we will have new sub committee in place.

## IUPAC CHEMISTRY AND THE ENVIRONMENT DIVISION VI

Reports to Council July 2021

(Division President: Prof Hemda Garelick)



### I. Executive Summary/Highlights:

Division VI: [Chemistry and the Environment Division](#) and its related sub-committees has members from over 20 different countries, Members are drawn from government, regulators, academia, industry and private consultancies, thus ensuring a wide range of expertise and experience, essential for solving complex problems. The Division membership and the members of its associated projects aim to offer learned and expert insight into the biophysico-chemical processes in environmental systems, including environmental and human health aspects related to the different environmental compartments, to food and agriculture and crop protection.

The Division regularly collaborates with other IUPAC Divisions and Standing Committees and these collaborations are listed in the projects sections (e.g. Div III, IV, V, VI, COCI, CCE, CHEMRAWN, ICGCSD and others). Projects in 2020-21: A detailed list is in Sections III and IV; highlights are below

Our projects have brought together industry, regulatory agencies, academia and researchers and provided global leadership on complex science issues (e.g. Nanomaterials/Nanopesticides, e-waste, risk assessment, microplastics, PFAS – section III. A number of completed projects have been submitted or published and presented in international conferences (Sections III & IV). These include:

- IUPAC leadership on Nanopesticides project has been recognized by the top-ranking journal Nature, and the IUPAC task group leader was invited by Nature Nanotechnology to contribute to a review, now published (Section IV). A new paper has been submitted to Nature Nanotechnology and is now under revision
- PAC- 2014-031-3-600 : (Purchase): Environmental and health challenges of e-waste and its management: an emerging 21st century global concern. (Published)
- PAC- 2016-015-2-600: (Perminova) "Intercalibration experiment on compositional space humic substances as measured by Fourier Transform Ion Cyclotron Resonance Mass Spectrometry" (accepted)
- PAC- 2015-056-3-600: (Kalderis) Glossary of terms used in biochar research. (Under review).
- H. Garelick has been invited to give a Keynote lecture on the IUPAC 'Environmental and health challenges of e-waste and its management' project in the conference "Physics and Radioelectronics in Medicine and Ecology Phreme'2020" Vladimir Russia, 07/2020
- E-waste in Africa: Through collaboration with CHEMRAWN and a number of Nigerian Young observers under the leadership of Division VI members (i.e. Sean Poopoola, Diane Purchase, Hemda Garelick, Nadia Kandle) a joint conference on "E-Waste Recovery and Management in Africa
- We have developed a long term collaboration with the Organisation for prohibition of Chemical Weapons and currently have two joint projects .
- We have participated in the 'IUPAC Global Women's Breakfast' event co-chaired and organised by a Division member: Dr Laura McConnell . Special participation reports have been submitted by Division members, Dr Bipul Saha who was very active in the organisation of the event in India , Prof Nadia Kandile who was one of the organisers in Egypt and Prof Hemda Garelick who was one of the organiser of a cross UK event. The involvement in GWB surprisingly was made easier through the virtual meeting facilities and many more women were able to participate in many countries.
- Due to the COVID19 effect, a slower progress of projects which are in place and many of the project had to extend their final deadlines. This particularly affected dissemination as it was more difficult to organised conferences and workshops. **Despite that Div VI has developed 4 symposia and a poster prize , for the IUPAC World Chemistry Congress 2021 Montreal, all of which have nominated keynote speakers**

## II. Plans and priorities for this biennium, and beyond:

Through its two subcommittees activities, the Division aims to reflect the multidisciplinary nature of our work and the core principles developed under the above direction

- Evaluation of current knowledge
- Development of guidance and recommendations
- Collaboration with stakeholders (academia, industry and public bodies)
- Inclusive communication across the world
- Dissemination and raising the profile of IUPAC

The Division membership continues to develop the principles above which underpin the project activities. It encourages early career scientists and Young Observers to join the activities, become members of the

### Continuing Projects

These include major new review projects which involve cross-collaboration across divisions and committees. Two of the latest projects which reflects this direction are;

- The Environment, Health and Food Safety Impact of Microplastics (Chaired by Dr Wu Div VI and involving Div II, IV, V, VII)
- Per and Polyfluoroalkyl Substances (PFAS) in the Environment: Information for Emerging Economies on PFAS Analyses in Environmental Media and their Impacts on Human Health (chaired by Dr Bradley Miller Div VI and involving Div V, CCE and COCI)
- Projects are being developed following the collaboration between IUPAC and OPCW.
  - Enhancing capabilities for the mitigation of chemical risk: the dissemination of the Emergency Response Guidebook in Russian-speaking countries. Collaboration with Div VII, CCE, OPCW and an EU project, (Led by Matteo Guidotti and Roberto Terzano Div VI)
- Bioavailability of endocrine substances in aquatic ecosystems (Led by Yehuda Shevah Div VI)

**Further projects details are in sections III and VI**

### Projects in development

- In collaboration with CHEMRAWN: International Equipment Sharing Networks – Current Status and The Future
- In collaboration with Green Chemistry: Green Chemistry in Sub-Saharan Africa
- PPE Disposal or Waste for yr 2050: This project is led by Div IV with full participation from Div VI and OPCW (Led by Marloes Peeters and Michal Walters Div IV)

### Dissemination

The dissemination is evident through previous conferences organised by the Division and also through a number of upcoming conferences planned for the next biennium

- **IUPAC World Chemistry Congress 2021 Montreal**, The integrated approach to the theme of chemistry and the environment has been raised in discussion with the organisers of the IUPAC World Chemistry Congress 2021. Following communications with colleagues from the Chemical Institute of Canada (CIC) we are working together to create a space in the conference where the focus of the contributions on the role of chemistry in studying and enhancing the environment will be presented. Three symposia will be presented at the 'IUPAC World Chemistry Congress 2021 Montreal' under the theme of Sustainability, sub-theme: 'Environmental Chemistry and Sustainability':
  - 'The environmental impact of fires': to be chaired by Prof Roberto Terzano (Italy) and Prof Fani Sakellariadou (Greece)
  - 'Emerging technologies and conservation practices for sustainable agriculture and public health': to be chaired by Prof Annemieke Farenhorst (Canada), Prof Diane Purchase (UK) and Dr Laura McConnell (US) – intra sub-committee collaboration.
  - 'Sustainable Polymers': to be chaired by Dr Weiping Wu (UK), Prof Bulent Mertoglu (Turkey), Prof Nadia Kandile (Egypt) and Prof Christine Luscombe (President of IUPAC Division IV, Polymer Division, US) – inter divisional collaboration.

- The Chemistry and the Environment Division Award 2021 (organised by Dr Bradley Miller) has again been proposed for the congress in Montreal
- 3 other symposia have been suggested by members of the CIC and we are expecting more to collaborate.
- **E-waste in Africa:** Through collaboration with CHEMRAWN and a number of Nigerian Young observers under the leadership of Division VI members (i.e. Sean Poopoola, Diane Purchase, Hemda Garelick, Nadia Kandle) a joint conference on “E-Waste Recovery and Management in Africa”, Nov 2021
- **APCE & CECE & ITP 2022 Angkor Wat, Nov. 2022.**  
Sokha Siem Reap Resort & Convention Center, Siem Reap, Cambodia  
IUPAC Special Sessions ([iupac.org/event/apce-cece-2020-2](http://iupac.org/event/apce-cece-2020-2))  
Organized by the Chemistry and the Environment Division, IUPAC “The Environment, Health and Food Safety Impact of Microplastics “Per and Polyfluoroalkyl Substances ( in the Environment”

### **III. An overall report of Division/Committee activities and achievements during the 2019-2020 biennium through subcommittees report**

There are two subcommittees whose activities are summarized in section III.

These demonstrate the Division's drive to address the provision of scientific expertise and raise IUPAC profile among the various stakeholder through project work, publication and symposia organisation. This is all underpinned by the activity of the two Division sub-committees

1. Advisory Committee on Crop Protection Chemistry  
[https://iupac.org/who-we-are/divisions/division-details/?body\\_code=604](https://iupac.org/who-we-are/divisions/division-details/?body_code=604)
2. Subcommittee on Chemical and Biophysical Processes in the Environment  
[https://iupac.org/who-we-are/divisions/division-details/?body\\_code=605](https://iupac.org/who-we-are/divisions/division-details/?body_code=605)

The membership of the subcommittees and particularly of the project teams is very diverse in terms of nationalities, involvements of other Divisions/committees and gender/age areas of expertise (we often invite scientists from other discipline to provide additional insights to our projects.) This is reflected in the activities of the 2 sub-committees reports as presented below. These address through their activities the Union Goals

- Provide scientific expertise to address critical world needs.
- Increase the value of our products and services.
- Improve the vitality, effectiveness and efficiency of our Union.

#### **i. Advisory Committee on Crop Protection Chemistry**

Membership on this committee is highly diverse with representatives from academia, government, and industry. Members represent 14 countries from North and South America, Europe, Asia, and Oceania and 40% of members are women. Since the beginning of 2020 this committee has met virtually approximately quarterly.

Our committee has launched a new newsletter blog "CropChem News" which will be published on the IUPAC website 3 to 4 times per year. A link to the first issue is at: <https://iupac.org/cropchem-news-feb-2021/>

On-going projects

2013-029-2-600 – Kleter

The IUPAC Project "Inventory of Developments in the Field of RNAi-Based Pesticides and Potential Needs for International Harmonization of Regulatory Safety Requirements", is led by Dr. Gijs Kleter of Wageningen Food Safety Research in Netherlands. He has recently published a mini-review paper in Pest Management Science.

Kleter, G. A. 2020. Food safety assessment of crops engineered with RNA interference and other methods to modulate expression of endogenous and plant pest genes. Pest Management Sci.  
<https://doi.org/10.1002/ps.5957>

Abstract: Genetically modified crops have been grown commercially for more than two decades. Some of these crops have been modified with genetic constructs that induce gene silencing through RNA interference (RNAi). The targets for this silencing action are genes, either specific endogenous ones of the host plant or those of particular pests or pathogens infesting these plants. Recently emerging new genetic tools enable precise DNA edits with the same silencing effect and have also increased our knowledge and insights into the mechanisms of RNAi. For the assessment of the safety

of foodstuffs from crops modified with RNAi, internationally harmonized principles for risk assessment of foods derived from genetically modified crops can be followed. Special considerations may apply to the newly expressed silencing RNA molecules, such as their possible uptake by consumers and interference with expression of host genes, which, however, would need to overcome many barriers. Bioinformatics tools aid the prediction of possible interference by a given RNA molecule with the expression of genes with homologous sequences in the host crop and in other organisms, or possible off-target edits in gene-edited crops.

2014-032-1-600 - Karpouzas

Advances on the Assessment of Pesticides' Soil Microbial toxicity: New research and regulatory aspects in light of the recent methodological advances

A review paper on regulatory aspects of soil microbial toxicity is in development.

## **ii. Subcommittee on Chemical and Biophysical Processes in the Environment**

The subcommittee focuses on topics regarding the distribution and environmental fate of chemicals (inorganic and organic compounds, nanomaterials), chemical and biophysical processes in environmental compartments (e.g., in soil and aquatic ecosystems) and interactions with organisms (bioavailability).

Although many of the members of the Subcommittee on Chemical and Biophysical Processes in the Environment are elected members of the IUPAC Division of Chemistry and the Environment (Division VI), the subcommittee is open to all scientists that are interested in questions regarding the topics of the subcommittee.

### **Recent activities**

#### **1. Membership update**

The list has been updated to reflect the current membership. The group comprises 29 international scientists.

The subcommittee secretary also reached out to former IUPAC YO network to recruit new members, especially from developing nations that are currently under-presented in the subcommittee.

## Project update

The subcommittee has received updates from all project chairs that are listed on IUPAC's project webpage with DVI assignments. <https://iupac.org/projects/>. A summary is provided in the table below.

Project	Updates
<b>2014-026-3-600 Obare</b>	Completing a book to be published by DeGruyeter.
<b>2014-031-3-600 Purchase</b>	Article published by PAC. collaboration with CHEMRAWN - E-waste in Africa meeting was to be held in May 2021. Levi Sydnese confirmed the conference is postponed.
<b>2015-056-3-600 Kalderis</b>	Manuscript submitted to PAC.
<b>2016-045-2-700 Xing</b>	manuscript is accepted by NanoImpact
<b>2016-016-2-600 Xing</b>	Update needed
<b>2016-047-1-600 Xing</b>	Update needed
<b>2018-035-1-600 Xing</b>	Book project with Wiley. Awaiting proof.
<b>2018-013-2-600 Shevah</b>	Progressing well. Progress report attached.
<b>2018-039-3-600 Sakellariadou</b>	Progressing and requested for extension.
<b>2019-026-2-600 Wu</b>	Progressing. A workshop to be held at the meeting in Angkor Wat.
<b>2019-029-2-600 Miller</b>	Progressing. A workshop to be held at the meeting in Angkor Wat.
<b>Workshop and Divisional Meeting in Angkor Wat</b>	DSC confirms the meeting will take place in November 2022

### 2. Website update

The content of the subcommittee website has been significantly revised and updated.  
[https://iupac.org/who-we-are/divisions/division-details/?body\\_code=605](https://iupac.org/who-we-are/divisions/division-details/?body_code=605)

### 3. LinkedIn webpage

Dr Walter Waldman is currently working on getting member profile stories created to have quarterly updates to the LinkedIn page and drive traffic to our page.

### 4. World Chemistry Congress – Montreal

Members of the subcommittee has been involved with organizing four symposia in Montreal congress:

- The Environmental Impact of Fires. Organizers (in alphabetical order by last name): Fani Sakellariadou, Roberto Terzano
- Emerging Technologies and Conservation Practices for Sustainable Agriculture and Public Health. Organizers (in alphabetical order by last name): Annemieke Farenhorst, Laura McConnell, Diane Purchase
- A Healthy Intake: Environmental Pollutants in Air, Water, Food and their Removal. Organizers (in alphabetical order by last name): Hind Al-Abadleh, Patrick Hayes, Bradley Miller, Kevin Wilkinson

- Sustainable Polymers Organizers (in alphabetical order by last name): Nadia G Kandile, Christine Luscombe, Bulent Mertoglu, Weiping Wu

## 5. New projects

A number of new projects have been approved.

- 2020-020-2-600 - [Enhancing capabilities for the mitigation of chemical risk: the dissemination of the Emergency Response Guidebook in Russian-speaking countries](#)
- 2020-019-4-050 - [Examples of the introduction of sustainable development as well as green industrial processes for Secondary School Chemistry and Introductory Chemistry](#)
- 2020-016-3-020 - [The Gender Gap in Chemistry – Building on the ISC Gender Gap Project](#)

A number of new projects have been developed.

- Development of three Environmental Chemistry and Sustainability symposia for the 'Chemistry for Sustainability' thematic programme in 51st IUPAC General Assembly & 48th World Chemistry Congress, Montreal, 2021
- In collaboration with CHEMRAWN: International Equipment Sharing Networks – Current Status and The Future
- In collaboration with Green Chemistry: Green Chemistry in Sub-Saharan Africa
- In collaboration with Division VI: Recommendations for bio-contaminated material waste for yr 2050

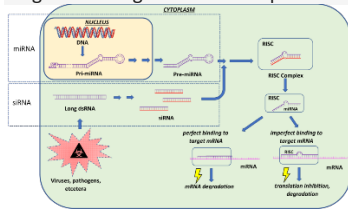
## Publications from the subcommittee's projects in 2020

- Global occurrence, chemical properties, and ecological impacts of e-wastes (IUPAC Technical Report), 2020, *Pure and Applied Chemistry*, in press. [IUPAC Project 2014-031-3-600](#) (Task Group Chair **D. Purchase**) – [Link](#) – [PDF](#)
- Interlaboratory comparison of humic substances compositional space as measured by Fourier transform ion cyclotron resonance mass spectrometry (IUPAC Technical Report), 2020, *Pure and Applied Chemistry*, Vol. 92, pp. 1447-1467. IUPAC [Project 2016-015-2-600](#) (Task Group Chair **I. Perminova**) – [Link](#) – [PDF](#)
- Guidelines for unequivocal structural identification of compounds with biological activity of significance in food chemistry (IUPAC Technical Report), 2019, *Pure and Applied Chemistry*, Vol. 91, pp. 1417-1437. IUPAC [Project 2013-024-2-600](#) (Task Group Chair **R.J. Molyneux**) – [PDF](#)
- **Hemda Garelick**, Khadijah Isimekhai, Alejandra Gonzalez Baez, Leonardo Pantoja-Munoz and **Diane Purchase** (2020). *E-Waste : What Is It ? Where Is It and Who Is Effected?*. Keynote Lecture at the International Scientific Conference. **"Physics and Radioelectronics in Medicine and Ecology Phreme'2020"** Vladimir Russia, 2-3/07/2020

#### IV. Tabular material.

##### a. Projects

Project Number (Task Chair)	Title	Status and report
2011-023-2-600 (Harris)	Critical review of approaches to dietary risk assessment for pesticides	Completed 14/8/2019 There are many approaches to calculating human exposure to pesticide residues via the diet. However, whilst the risk assessment paradigm used is the same, it is applied in widely varying ways around the world leading to different conclusions for similar data sets. The objective is to capture these and bring together a definitive set of models and overviews in a single publication.
2011-060-1-600 (Rüdel) -	Consideration of bioavailability of metals/metal compounds in the aquatic environment:	Completed 30/9/2017 The project has provided information on metal and metalloid bioavailability and the application of Biotic Ligand Model and bioavailability-based software tools for freshwater risk assessment. A first outcome of the project is a review on the current state of the application of bioavailability-based approaches in risk assessment approaches. The findings from this project is being disseminated via a websites <a href="http://www.metal-bioavailability.org/">http://www.metal-bioavailability.org/</a> on the bioavailability of metals. Similar websites for other projects (e.g. on e-waste is currently under development. Finding from this project have been presented in the special IUPAC symposium during the SETAC 2018 conference in Rome and published in Environmental Science and Pollution Research.
2012-019-1-600 (Unsworth)	The Importance of Chemistry in Maintaining a Secure Food Supply	Completed 12/8/2019 The book published by Springer Nature is available as ebook <a href="https://doi.org/10.1007/978-3-030-17891-8">https://doi.org/10.1007/978-3-030-17891-8</a> ; the chapter (first online 29 May 2019), titled <i>The Battle for a Sustainable Food Supply</i> (pp. 13-84) by John Unsworth, Yoshiaki Nakagawa, Caroline Harris, Gijs Kleter is an outcome is this project.
2013-024-2-600 (Molyneux)	Recommended Methods for the Structural Identification of Biologically Active Compounds in Food and Flavor Chemistry	Completed 12/8/2019 A Technical Report prepared by Molyneux, R., Beck, J., Colegate, S., et al., titled "Guidelines for unequivocal structural identification of compounds with biological activity of significance in food chemistry" is published in <i>Pure and Applied Chemistry</i> 2019, 91(8), pp. 1417-1437; <a href="https://doi.org/10.1515/pac-2017-1204">https://doi.org/10.1515/pac-2017-1204</a>
2013-029-2-600 (Kleter)	Inventory of developments in the field of RNAi-based pesticides and potential needs for international harmonization of regulatory safety requirements	Near completion  The IUPAC Project " <a href="#">Inventory of Developments in the Field of RNAi-Based Pesticides and Potential Needs for International Harmonization of Regulatory Safety Requirements</a> ", is led by <a href="#">Dr. Gijs Kleter</a> of Wageningen Food Safety Research in Netherlands. He has recently published a mini-review paper in Pest Management Science. Kleter, G. A. 2020. Food safety assessment of crops engineered with RNA interference and other methods to modulate expression of endogenous and plant pest genes. <i>Pest Management Sci.</i> <a href="https://doi.org/10.1002/ps.5957">https://doi.org/10.1002/ps.5957</a> Abstract: Genetically modified crops have been grown commercially for more than two decades. Some of these crops have been modified with genetic constructs that

Project Number (Task Chair)	Title	Status and report
		<p>induce gene silencing through RNA interference (RNAi). The targets for this silencing action are genes, either specific endogenous ones of the host plant or those of particular pests or pathogens infesting these plants. Recently emerging new genetic tools enable precise DNA edits with the same silencing effect and have also increased our knowledge and insights into the mechanisms of RNAi. For the assessment of the safety of foodstuffs from crops modified with RNAi, internationally harmonized principles for risk assessment of foods derived from genetically modified crops can be followed. Special considerations may apply to the newly expressed silencing RNA molecules, such as their possible uptake by consumers and interference with expression of host genes, which, however, would need to overcome many barriers. Bioinformatics tools aid the prediction of possible interference by a given RNA molecule with the expression of genes with homologous sequences in the host crop and in other organisms, or possible off-target edits in gene-edited crops.</p>  <p>Graphical summary of the RNAi mechanism (reproduced with permission from G. Kleter)</p> <p>For more information, see an earlier paper published by Dr. Kleter: Kleter, G. A., Kuiper, H.A., Kok, E.J. 2019. Gene-edited crops: towards a harmonized safety assessment, Trends in Biotechnol. <a href="https://doi.org/10.1016/j.tibtech.2018.11.014">https://doi.org/10.1016/j.tibtech.2018.11.014</a></p>
2014-026-3-600 (Obare)	<u>Chemical speciation of anthropogenic nanoparticles.</u>	<p>On-going Due Dec. 2021</p> <p>To develop guidelines and provide a framework for understanding the chemical speciation of nanoparticles and the associated environmental health and safety issues.</p>
2014-031-3-600 (Purchase)	Environmental and health challenges of e-waste and its management: an emerging 21 <sup>st</sup> century global concern	<p>On-going 2014-031-3-600 (Purchase) - <i>The environmental and health challenges of e-waste and its management: an emerging 21<sup>st</sup> century global concern</i>: This project aims to bring together global expertise to a) examine current research on the chemical nature of e-waste and its global distribution; b) evaluate its environmental and health impact of e-waste and related risk management tools and models; c) identify shortcomings in present regulations and management strategies as well as future challenges; and d) develop a set of specific recommendations for management approaches that are science-based and globally informed. A manuscript entitled "A critical review on the chemical properties and ecological impacts of e-wastes" Pure and Applied Chemistry. In Press. ISSN 0033-4545.</p>
2014-032-1-600 (Karpouzias)	Advances on the Assessment of Pesticides' Soil Microbial toxicity: New research and regulatory aspects in light of the recent methodological advances	<p>On-going</p> <p>The conclusions drawn from this project and a proposal for the regulatory framework regarding the assessment of the soil microbial ecotoxicity of pesticides will be summarized in a paper which will be published in a relevant journal as open access to increase visibility. Data was presented in the 14th IUPAC International Congress of Pesticide Chemistry in Ghent, May 2019.</p> <p>A draft review paper is in preparation. Preparation of final deliverables.</p>

Project Number (Task Chair)	Title	Status and report
2015-010-3-600 (Keen)	Standardization of electrical energy per order (EEO) reporting for UV/H <sub>2</sub> O <sub>2</sub> reactors	Completed 30/6/2020 Extended till end of March 2020, in order to present the project results in an International Conference.
2015-056-3-600 (Kalderis)	Glossary of terms used in biochar research	On-going Final manuscript under review
2016-015-2-600 (Perminova)	Database on molecular compositions of natural organic matter and humic substances as measured by high resolution mass spectrometry	Completed 31/8/2020 A Final technical report on the project has been prepared and was approved by the Division for publishing in PAC. The first version was submitted in July 2019, the revision was submitted on December 23. Unfortunately, it is still under review. The manuscript is entitled "Intercalibration experiment on compositional space humic substances as measured by Fourier Transform Ion Cyclotron Resonance Mass Spectrometry" Author(s): A. Zhrebker, S. Kim, Ph. Schmitt-Kopplin, R.G.M. Spencer, O. Lechtenfeld, D.C. Podgorskii, N. Hertkorn, M. Harir, N. Nurfajin, B. Koch, E.N. Nikolaev, E.A. Shirshin, S.A. Berezin, D.S. Kats, G.D. Rukhovich, I.V. Perminova*
2016-016-2-600 (Kookana)	Guidance for Industry and Regulators on Assessment of the Environmental Fate and Risks of Nano-enabled Pesticides	On-going Based on the Nantes workshop and subsequent work by the project team, an article entitled "Ecological risk assessment of nano enabled pesticides: A perspective on problem formulation" has been developed that has now been published by Journal of Agricultural and Food Chemistry, 2018, 66, 6480-6486, in the special issue "Nanotechnology applications and implications of agrochemicals toward sustainable agriculture and food systems" under the "Perspectives" category. In this paper, a group drawn from regulatory agencies, academia, research and the agrochemicals industry offered a perspective on relevant considerations pertaining to the problem formulation phase of the ecological risk assessment of nano-enabled pesticides.
2016-019-2-600 (Terzano)	Trace elements analysis of environmental samples with X-rays: from synchrotron to lab and from lab to synchrotron	Completed 3/6/2019 A one-day special Symposium entitled "TRACE ELEMENTS ANALYSIS OF ENVIRONMENTAL SAMPLES WITH X-RAYS" was organized during the ICOBTE 2017 Conference, which took place in Zurich (Switzerland) from 16 to 20 July 2017. An IUPAC Technical Report has been published by Pure & Applied Chemistry.
2016-047-1-600 (Xing) Extended to 2018-035-1-600 (Xing)	Multi-scale Biogeochemical Processes in Soil Ecosystems: Critical Reactions and Resilience to Climate Changes	On-going Submissions of 14 chapters to Wiley by end of April. Expected to be completed by 6/2021

Project Number (Task Chair)	Title	Status and report
2017-013-1-600 (Racke)	Crop protection chemistry in Latin America: Harmonized approaches for environmental assessment and regulation	On-going
2017-035-2-600 (Kookana)	Human Health Risk Consideration of Nano-enabled Pesticides for Industry and Regulators	<p>On-going</p> <p>IUPAC project was jointly developed by IUPAC Divisions VI and VII with COCI on human Health Risk Consideration on Nano-enabled Pesticides to provide guidance to industry and regulators. The key objective of the project is to assist industry, contract research organizations and regulators in determining an acceptable and practical approach for identifying and generating the data relevant to human health risk assessment required for the registration of nano-enabled pesticides.</p> <p>The project made an excellent start in June 2018 with a project workshop in Boston to coincide with the Gordon Research Conference on Nanoscale Science and Engineering for Agriculture and Food Systems. The objective of the workshop was to identify questions that are specific to nano-enabled pesticides that must be addressed in addition to the questions normally asked for conventional pesticides. The workshop brought together a range of expertise from regulators, industry, researchers and academia. Regulatory agencies namely, US Environment Protection Agency (EPA), US Food and Drug Administration (FDA), Health Canada, Australian Pesticides and Veterinary Medicines Authority (APVMA), each provided an overview of their approach for regulating nano-enabled pesticides/nanomaterials. Vive Crop Protection represented industry.</p> <p>The second workshop in the project was held after IUPAC GA in Paris in July 2019, in London at Middlesex University and a framework for human health considerations for nanopesticides was considered. The workshop was attended by European Food Safety authority, OECD, Health Canada, BFR Germany and Vive Crop Protection among others. The framework is currently being reviewed by colleagues, e.g. in BFR Germany. A draft paper for publication is being developed.</p> <p>An article has been written for Chemistry International which is likely to be published soon.</p>
2018-013-2-600 (Shevah)	Bioavailability of endocrine substances in aquatic ecosystems	<p>On-going</p> <ol style="list-style-type: none"> <li>1. The number of the WG members was increased to 11</li> <li>2. An extensive literature survey was prepared and circulated</li> <li>3. The first Working Paper on EDCs residues monitoring in Israel was prepared and circulated, asking to prepare same in other countries by the WG members.</li> <li>4. Review and comments by the WG members are pending.</li> <li>5. A workshop on Dutch research and innovations on micro-pollutants removal from municipal wastewater (Amsterdam</li> </ol>

Project Number (Task Chair)	Title	Status and report
		Nov, 7, 2019) was attended by the TL. Engineering and technology breakthrough attained by several Dutch research groups were presented, detailing design parameters, influent and effluent quality, CO2 footprint and costs. A summary report is being prepared and will be circulated shortly.
2018-026-2-600 (Purchase)	Development of a technical symposium on 'Innovative Chemistry for Environmental Enhancement' for Theme 3 'Chemistry for the Environment' at the 47th IUPAC World Chemistry Congress, Paris, 2019	Completed 8/11/2019 The aim of the symposium is to highlight the role of chemistry in providing innovative solutions to meet environmental challenges as well as enhance the environment. Excellent keynote and invited speakers around the world delivered their talks in the conference. An article on the symposium has been published in Chemistry International.
2018-039-3-600 (Sakellariadou)	Seabed Mining and Blue Growth: Exploring the Potential of the Marine Mineral Deposits as a Sustainable Source of Rare Earth Elements (Maree)	The task group had a face-to face meeting on Nov.2019 The extensive report is almost finished and it is expected to be sent to PAC for review and publication by April 2021.
2018-014-1-600 (Gubala)	CHEMISTRY IN THE CLASSROOM	On-going A joint project led by Div VII and CCE. Results were presented in Paris Congress in 2019. No reports since
2019-026-2-600 (Weiping Wu Yong-Chien Ling)	The Environment, Health and Food Safety Impact of Microplastics	On-going First task group meeting has taken place in March 2020. A number of virtual meetings have taken place since.
2019-029-1-600 (Mélanie Kah Bradley Miller)	Per and Polyfluroalkyl Substances (PFAS) in the Environment: Information for Emerging Economies on PFAS Analyses in Environmental Media and their Impacts on Human Health	On-going First task group meeting has taken place in March 2020
2020-020-2-600 (Guidotti)	<u>Enhancing capabilities for the mitigation of chemical risk: the dissemination of the Emergency Response Guidebook in Russian-speaking countries</u>	On-going The project is a collaborative with the OPCW and a related EU project. It is also a collaboration with Div VII and CCE. The first meeting took place on 17/03/21

a. Conference presentations

**Hemda Garelick**, Khadijah Isimekhai, Alejandra Gonzalez Baez, Leonardo Pantoja-Munoz and **Diane Purchase** (2020). *E-Waste : What Is It ? Where Is It and Who Is Effected?*. Keynote Lecture at the International Scientific Conference. "**Physics and Radioelectronics in Medicine and Ecology Phreme'2020**" Vladimir Russia, 2-3/07/2020

**Keleter 2020**. G. Kleter\*, IUPAC Project team, H. Kuiper, "RNA interference-based crop protection: Food & feed safety, detectability, regulation, and efforts towards international harmonization IUPAC2019 international pesticides congress in Ghent, May 20<sup>th</sup>, 2019

**B. Saha**, Status of R&D and Manufacturing of Biopesticides and Biostimulants in India, 2019, IUPAC International Congress of Pesticide Chemistry, Ghent, Belgium

**B. Saha** and Kamlesh Dasgupta, Dissipation and residue analysis of Imidacloprid in Okra crop (Ladies' finger) under field conditions in different agro-climatic zones of India., 2019, IUPAC International Congress of Pesticide Chemistry, Ghent, Belgium

Prof Nadia Kandile. (2019). Kyenote: Overview and Difications on Climate change.

In: Climate Change in an African Context (Igniting the Power of Science

African Science Week, Science talks, workshop and expo . Organized by Prof. Ghada Bassioni

16 December 2019 Academy of Scientific Research and Technology, Cairo, Egypt

Green Chemistry for Sustainability. Symposium Chairman :, Prof. Dr. **Nadia Kandile** and Symposium Coordinator Prof. Dr. Ghada Bassioni. Under the Auspices of, Prof. Dr. Mahmoud Sakr, President of the Academy of Scientific Research and Technology, Organized By "National Committee for Pure and Applied Chemistry NAPAC, 7th December 2019 Academy of Scientific Research and Technology, Cairo, Egypt

L. Pantoja Munoz\*, A. Gonzalez Baez, D. Mckinney, **H. Garelick\*** (2019) Microplastics and Wet-Wipes: Should They Be Flushed into The Sewer System. IUPAC 47th World Chemistry Congress (in Paris 5-12 July, 2019 Theme: Chemistry and Society : Current Knowledge

**D. Purchase\***, G. Abbasi, L. Bisschop, D. Chatterjee, C. Ekberg, P. Fedotov, **H. Garelick**, **N. Kandile**, **M. Lundström**, A. Matharu, **B. Miller**, A. Pineda, O. Popoola, T. Retegan , H. Ruedel, A. Serpe, Y. Sheva, K. Surati, F. Walsh, B.P. Wilson, M.H. Wong (2019) E-Waste - An Emerging 21st Century Global Grand Challenge: Global Occurrence, Chemical Properties and Ecological Impacts. IUPAC 47th World Chemistry Congress (in Paris 5-12 July, 2019 Theme: Chemistry and Society : Current Knowledge

**W. Wu**, R. Bradley, F. Liu, Y. Lai, B. Zhao, Novel Materials and Devices for Sustainable Energy Applications, IUPAC 47<sup>th</sup> World Chemistry Congress in Paris 5-12 July, 2019 Theme: Chemistry for the Environment: Innovative Chemistry for Environmental Enhancement

R. Bradley, F. Liu, H. Yang, B. Zhao, **W. Wu**, A Novel Biomass Derived Low-Cost Mesoporous Carbon, CARBON 2019 World Carbon Conference, UKY Lexington KY, 14-19 July 2019.

Gonzalez Baez A.\*, Pantoja Munoz L., **Garelick H.**, and **Purchase D.** (2019). Urban mines, recovering Rare Earth Elements from Waste Printed Circuit Boards (WPCBs) through bioleaching. CEST 2019. 16th International Conference on Environmental Science and Technology. Rhodes, Greece, 4 - 7 September 2019

Amabogha O. N., **Purchase D**, **Garelick H.** and Jones H. (2019) .Combining phytoremediation with bioenergy production: Developing a multi-criteria decision matrix for species selection. CEST 2019. 16th International Conference on Environmental Science and Technology. Rhodes, Greece, 4 - 7 September 2019

**B. Saha**, "Biofertilizers and Biopesticides: Development Trends and Market Overview in India", 3<sup>rd</sup> International Conference on Biofertilizers and Biopesticides, Taipei , Taiwan, 7<sup>th</sup> to 10<sup>th</sup> August, 2018

b. Presentations IYPT and IUPAC100 and GWB

Member of Div VI have participated in the 'IUPAC Global Women's Breakfast' event co-chaired and organised by a Division member: Dr **Laura McConnell** . Special participation report have been submitted by Division members, Dr **Bipul Saha** who was very active in the organisation of the event in India , Prof **Nadia Kandile** who was one of the organisers in Egypt and Prof Hemda Garelick who was one of the organiser of a cross UK event.

GWB2021: We had very successful GWB2021 program in India. Out of 324 global events, 61 events were held in India. There was very enthusiastic participation. In one webinar, I made a presentation on “Best Practices of Promoting Women Scientists in Indian Organizations”. It was attended by more than 1500 participants. **Bipul Saha**

IUPAC Global Women's Breakfast  
Global Network in Support of Empowering Women in Science(EGYPT)

The National Committee for Pure and Applied Chemistry at the Academy of Scientific Research and Technology was hold a breakfast on 12.02.2020 to empower women in science chaired by Prof. Dr. Nadia Kandile, Ass. Member of IUPAC and Prof. Dr. Ghada Bassioni, member of IUPAC executive bureau.

World Mycotoxin Forum 2019: **Prof Diane Purchase** of the subcommittee represented IUPAC to give a keynote in the World Mycotoxin Forum meet IUPAC100 in Belfast (14-16 October 2019). <https://www.worldmycotoxinforum.org/>

Symposium Chairman: **Prof.Nadia Kandile** - Symposium Coordinator:Prof. Dr. Ghada Bassioni  
Celebrating the International Year of the Periodic Table of Chemical Elements (Chemistry Education),Main Hall of the Academy of Scientific Research and Technology, 17 March 2019.

**Keynote lecture** by **Prof. Nadia Kandile** with the title : Introduction to the International Union of Pure and Applied Chemistry, conference of the Egyptian Committee of Pure and Applied Chemistry 20-22 Oct 2019, Hurghada, Egypt.

**B. Saha**, Selection of IYPT 2019 Activities and Publicity in India, Invited speech delivered in the Closing Ceremony of IYPT, Tokyo, December 5, 2019

**B. Saha**, “History of Genesis of IUPAC and its current activities” and “Life and Works of Mendeleev”, In augural program of IUPAC Centenary and 150<sup>th</sup> Anniversary of Periodic Table , January 02, 2019, Hyderabad

B. Saha, “IUPAC Centenary” and “Life and Works of Mendeleev” and “IYPT”, Federation of Indian Chambers of Commerce and Industry, New Delhi, January 09, 2019

**B. Saha**, “IUPAC Centenary” and “International Year of Periodic Table of Chemical Elements 2019”, Annual General meeting of PMFAI, Mumbai, January 10, 2019

**B. Saha**, “Mendeleev and Periodic Table”, Indian Institute of Chemical Technology, Hyderabad, February 1, 2019

**B. Saha**, “History of IUPAC and Current Activities” and “Mendeleev's Periodic Table”, Vivekananda College, Secunderabad, June 23, 2019

**B. Saha**, “Mendeleev's Periodic Table” and “Fun with Elements”, Science Fair on Periodic Table jointly organized by the Royal Society of Chemistry (London) – India Chapter, Indian Institute of Chemical Technology and White Board Ventures.

**B. Saha**, “Life and Works of Mendeleev”, Tamil Nadu State Level IYPT Celebrations, Coimbatore, November 8, 2019

**B. Saha**, Review of IUPAC Centenary and IYPT activities in India, Closing ceremony in India, Hyderabad, Dec 18. 2019.

c. Selected Publications

MacMartin, T. L., Graham, C. I., **Farenhorst, A.**, & Brassinga, A. K. C. (2021). Complete Genome Sequences of Two Environmental Legionella Isolates Obtained from Potable Water Sourced in a First Nation Community. *Microbiology Resource Announcements*, 10(4).

Victor Castro Gutierrez, Francis Hassard, Rodrigo Leita, Beata Burczynska, \_View  
Dirk Wildeboer, Isobel Stanton, Shadi Rahimzadeh, Gianluca Baio, **Hemda** Garelick, Jan Hofman, Barbara Kasprzyk-Hordern, Rachel Kwiatkowska, Azeem Majeed, Sally Priest, Jasmine Grimsley, Lian Lundy,Andrew C Singer, Mariachiara Di Cesare (2021) Monitoring occurrence of SARS-CoV-2 in school populations: a wastewater-based approach.  
doi: <https://doi.org/10.1101/2021.03.25.21254231>

Melanie Kah\*, Linda J. Johnston, Rai Kookana, Wendy Bruce, Andrea Haase, Vera Ritz, Jordan Dinglasan, Shareen Doak, Hemda Garelick, Vladimir Gubala (2021) Comprehensive Framework for Human Health Risk Assessment of Nanopesticides. Submitted to Nature Nanotechnology.

Melanie Kah and **Rai Kookana**(2020) Emerging investigator series: nanotechnology to develop novel agrochemicals: critical issues to consider in the global agricultural context. *Environmental Science Nano*. DOI: 10.1039/d0en00271b. rsc.li/es-nano

**Nadia G. Kandile**, Mansoura I. Mohamed, Howida T. Zaky, Abir S. Nasr, Yassmin G. Ali, (2021) Quinoline anhydride derivatives cross linked chitosan hydrogels for potential use in biomedical and metal ions adsorption, *Polymer Bulletin* Published online: 12 March (2021)

**YC Ling**. Laundry pollutes the ocean! <https://www.youtube.com/watch?v=fgx7Jc8k-lw>. *New Deeper Once in SET News Channel Taiwan*. March 15, 2021.

**YC Ling**. Experience sharing of higher education institutions to help achieve sustainable development goals through green sustainable chemistry. Special Symposium on Green Chemistry. *2021 National Chemistry Meeting Taiwan*. March 12-14, 2021.

**Purchase D**, Abbasi G, Bisschop L, Chatterjee D, Ekberg C, Fedotov P, Garelick H, Kandile N, Lundström, Matharu A, Miller B, Pineda A, Popoola O, Retegan T, Ruedel H, Serpe A, Sheva Y, Surati K, Walsh F, Wilson B.P. and Wong MH. 2020. Global occurrence, chemical properties and ecological impacts of e-wastes (IUPAC Technical Report). *Pure and Applied Chemistry*. 92, 1733-1767. DOI: <https://doi.org/10.1515/pac-2019-0502>

Johnston L.J, Gonzalez-Rojano N, Wilkinson K.J. and **Xing B**. (2020) Key Challenges for Evaluation of the Safety of Engineered Nanomaterials. *NanoImpact*, 18, 100219. <https://doi.org/10.1016/j.impact.2020.100219>.

L. Zhang, Y. Song, **W. Wu**, R. Bradley, Y. Hu, Y. Liu, S. Guo, Fe<sub>2</sub>Mo<sub>3</sub>O<sub>8</sub> nanoparticles self-assembling 3D mesoporous hollow spheres toward superior lithium storage properties, *Frontiers of Chemical Science and Engineering*, 15, 156–163, 2021.

**W. Wu**, X. Fan, Y. Li, R. Dong, Growing collaborations between Chinese and UK young scholars on chemical science and technology. *Frontiers of Chemical Science and Engineering*, 15, 1–3, 2021.

**Purchase, D.**, Chen, W., **Garelick, H.**, **Kandile, N. G.**, **Kookana, R.**, **Miller, B.**, & **Terzano, R.** (2020). Innovative Chemistry for Environmental Enhancement, *Chemistry International*, 42(1), 41-44. doi: <https://doi.org/10.1515/ci-2020-0130>

**Bipul B. Saha** and NJC Reddy, 150<sup>th</sup> Anniversary of Periodic Table and Mendeleev, 2019, *Chemical News*, pp26-29.

**Bipul B. Saha**, Report of IUPAC Workshop on “Green Chemistry” held in Rome from 28<sup>th</sup> February to 1<sup>st</sup> March, 2019, *Pestology*, Vol. XLIII No. 3, March 2019, pp 18-20

**B. Saha**, Report on the Closing Ceremony of the International Year of the Periodic Table, *Chemical News*, January 2020, pp 70-72

**.B. Saha** and Jaychandra Reddy N, 150<sup>th</sup> Anniversary of Periodic Table and Mendeleev, *Chemical Industry Digest Annual*, January 2019, pp 84-88

**Saha, B. B.**, Reddy, N., Chandra, J. (2019). 150<sup>th</sup> Anniversary of Periodic Table and Mendeleev, *Chemical News (India)*, XIX, (2), 26-29.

**Ken Racke**, Pieter Spanoghe, Nathan De Geyter and Bipul Saha (2019) Summary of 14th IUPAC International Congress of Crop Protection Chemistry, and IUPAC Award Presentation (Published Online in *Chemistry International*: 2019-10-31 DOI: <https://doi.org/10.1515/ci-2019-0429> )

**Rai Kookana** and Linda Johnston (2019) Human Health Risk Consideration on Nano-enabled Pesticides for Industry and Regulators, (Published Online in *Chemistry International*: 2019-10-31 | DOI: <https://doi.org/10.1515/ci-2019-0416>)

**Rai Kookana** and Linda Johnston (2019) Guidelines for unequivocal structural identification of compounds with biological activity of significance in food chemistry (IUPAC Technical Report). (Published Online in *Chemistry International*: 2019-10-31 | DOI: <https://doi.org/10.1515/ci-2019-0421>)

**Terzano R**, Denecke MA, Falkenberg G, Miller B, Paterson D, Janssens K (2019). Recent advances in analysis of trace elements in environmental samples by X-ray based techniques (IUPAC Technical Report). *PURE AND APPLIED CHEMISTRY*, vol. 91, p. 1029-1063, doi: 10.1515/pac-2018-0605.

**Terzano R** (2019). Trace elements analysis of environmental samples with X-rays. *Chemistry International*, 41(4), 42-43, doi: <https://doi.org/10.1515/ci-2019-0417>

F. Liu, Y. Lai, B. Zhao, R. Bradley, **W. Wu** (2019), Photothermal Materials for Efficient Solar Powered Steam Generation, *Frontiers of Chemical Science and Engineering*, 13, 636-653. <https://doi.org/10.1007/s11705-019-1824-1>

Kah, M., **Kookana, R.S.**, Gogos, A., Bucheli, T.D. (2018). A critical evaluation of nanopesticides and nanofertilizers against their conventional analogues. *Nature Nanotechnology*, 13, 677–684

**Report to Council 2021**  
**Division VII Chemistry and Human Health**  
**Rita Cornelis**

**I. Highlights and/or Executive Summary:**

Due to the turmoil created by the Covid pandemic, members of Division VII had to adapt their lifestyle. They expressed limitations to the time that they could devote to IUPAC. I hope that in 2022 prospects will be better and face-to-face meetings restored. These are quintessential for stimulation and efficiency of the work within the subcommittees by scientists residing all over the globe. Teleconferences are not able to sustain cohesion between members to the same extent.

The three subcommittees (SC) of Division VII are structured as follows:

- Drug Discovery and Development (DDD), Chair Gerd Schnorrenberg
- Toxicology and Risk Assessment (TRA) Chair Vincenzo Abbate, succeeding John Duffus
- Nomenclature for Properties and Units in Clinical Chemistry (NPU) Chair Ulla Magdal Petersen, succeeding Helle Johannessen

The membership of the 3 subcommittees has been updated and new members joined. They are listed on the iupac.org site, Division VII.

The subcommittees will continue their actions as usual. The SC DDD has Teleconferences every trimester.. The subcommittees TRA and NPU continue to work on their projects.

The status of the ongoing projects (total 10 + 4 interdivisional projects) are given below. Seven projects were completed. The publications include 3 books. They all contribute to IUPAC's goal to provide an indispensable worldwide resource for chemistry related to human health.

The royalties of all books, past and new publications, contribute to the revenue of IUPAC, be it in a modest way. The quality of these books is outstanding and the amount of work the authors have put into these volumes is impressive.

Another gem of Division VII and more particularly of the DDD subcommittee is the attribution of the 2020 IUPAC-Richter Prize in Medicinal Chemistry to John Macor, PhD, Global Head Integrated Drug Discovery, Sanofi, for the development of drugs for the treatment of migraine

In 2020 Mike Schwenk was awarded the Emeritus Fellowship. He was Titular Member and Secretary of Division VII (2020 – 2016) and currently corresponding member with the Interdivisional Standing Committee on Green Chemistry for Sustainable Development.

A major priority of Division VII is the revision of the Goldbook. Doug Templeton has already initiated this. The project (#2021-004-2-700), entitled

**Gold Book update of terms for chemistry and human health,**

was approved March 2021. The task group consists of members of each subcommittee: Gerd Schnorrenberg of DDD, Brandon Presley and John Duffus of TRA and Helle Møller Johannessen of NPU.

## II. Plans and priorities for this biennium, and beyond:

### **Goals for IUPAC Division VII Subcommittee Drug Discovery and Development (DDD)**

- \_Generate new projects in line with IUPAC's strategic goals and the changing landscape in Drug Discovery and Development
- Progress and finalize ongoing projects successfully
- \_Implement new working modes in SC D3 to increase interactivity between SC members and external experts in the area D3
- \_Utilize SC D3 NEWSLETTER as a vehicle to increase the IUPAC exposure and to explore potential funding mechanism for D3 specific projects that may fall within the broader scope of D3, for ex: other factors that influence the chemistry of D3 such as Chemistry–Biology feedback loop
- \_Increase visibility of SC D3 in the Drug Discovery and Development community
- \_Attract new members for SC D3

### **Goals for IUPAC Division VII Subcommittee on Toxicology and Risk Assessment (TRA)**

- \_Coordinate projects relating to toxicology and risk assessment and to provide a forum for discussing their progress
- \_Provide a forum for initiating new project submissions in toxicology and risk assessment appropriate to Division VII
- \_Report to the Division VII President and the Division Committee on the progress of current projects and to initiate new projects
- \_Provide connections to other organizations concerned with toxicology, between others with OPCW
- \_Interact with chemists in the Chemical Industry worldwide in the field of toxicology and risk assessment
- \_Offer advice to the Division President and Committee on matters concerning toxicology and risk assessment, in all their aspects from the purely chemical to the protection of human health and the natural environment
- \_The SC's strategy for next biennium (and beyond) will be to strengthen links with other Divisions (e.g. new interdivisional project "A database of chemical structures and identifiers used in the control of WADA Prohibited Substances") between Divisions VII-VIII as well as create new links with appropriate International bodies (e.g. EC and WADA) to primarily harmonise and create a unique chemistry language with respect to drugs of abuse and misused drugs

### **Goals for Division VII SubCommittee on Nomenclature for Properties and Units (NPU)**

The NPU coding system provides a terminology for Properties and Units in the Clinical Laboratory Sciences. The availability of electronic patient records would greatly increase the quality of health care, reduce health care cost and facilitate epidemiological surveys to the benefit of patients worldwide. In developing a generalized architectural build up and adherent structures, there is a need for systems and schemes in each of the medical domains to support and populate the electronic patient record. In the domain of clinical laboratory medicine the guidelines from IFCC-IUPAC on the structuring of properties, on kind-of-properties and on units are needed if a coherent system with global acceptance is to be worked out. The SC-NPU maintains its website [www.npu-terminology.org](http://www.npu-terminology.org). to make available the complete contents of the generic NPU database for electronic downloading of the NPU Terminology.

- The goals are:
- \_Make recommendations on NPU for reporting clinical laboratory data that conform to or adapt current standards of authoritative organizations, that will improve their utilization for health care
  - \_Provide a connection with other organizations concerned with NPU, such as BIPM, CEN and ISO, and, by extension, clinical laboratory science societies, and the in vitro diagnostics industry, to ensure that problems encountered by health care professionals in the area of NPU are considered by those organizations
  - \_Act as a consultant group on NPU in clinical chemistry and, by extension, in the rest of clinical laboratory sciences to international scientific panels, regional and national clinical laboratory sciences organizations, editors of scientific journals, manufacturers of clinical laboratory instrumentation and products, and to individual clinical laboratory professionals and other health care professional
  - \_Develop activities with other Organizations: an upcoming collaboration between WHO, LOINC and NPU aims at coordinating the use of terminology and classifications in individual clinical laboratory professionals and other health care professionals.

### **III. Overall report of Division/Committee activities and achievements during the later part of the 2018-2019 biennium and through 2020 organized by the Goals and Objectives laid out in the current IUPAC Strategic Plan**

#### **Ongoing Projects**

##### **Project 2003-044-1-700, Ganesan**

The manuscript was submitted to ICTNS for publication in PAC. It appears to be still under review.

##### **Project 2010-035-3-700, Johannessen**

Final Drafts have been circulated, and should be ready for publication very soon. Should not be difficult to finalize, but it is very important to do it right as it will be an increasingly important part of the NPU terminology work.

##### **Project 2011-018-700, Erhardt**

The project it is still scheduled for June 2021 but if COVID continues to slow things down Prof Erhardt may have to extend that. He will know better about such a forecast in the near future

##### **Project 2014-017-1-700, Karlsson**

The manuscript was approved by Division VII and submitted as a technical report for publication in PAC.

##### **Project 2014-019-1-700, Abbate**

The project on psychoactive drugs was extended until Dec 2020. However, the combination of the pandemic and paternity leave has meant there has not been much progress this year, except for two Skype meetings to discuss a potential way forward and make soon a decision whether to complete part 2 and publish a second paper or to close the project.

##### **Project 2016-044-2-700, Hansen**

The project is not finished yet, but about 80% of the main content of concepts (kind-of-properties) are listed. Links to the general NPU concept model is not completed. A review group consisting of members of the three release centers is considered.

##### **Project 2017-040-1-700, Gubala**

Four animations were created under this project and they were *Carbon cycle*, *2 x Plastics in the ocean*, *Cell cycle and medicine*.

In February 2020, the videos were embedded in a lesson plan, created by Claire Saunders (one of the task members) and supplied to chemistry teachers in three secondary schools: one in London, one in Broadstairs (county Kent) and one in Medway (county Kent). The aim was to collect feedback from teachers to improve the lesson plan and roll it out to multiple schools, firstly in the UK.

Unfortunately, the progress of this project was significantly slowed down due to Covid.

##### **Project 2019-018-2-700, Liebman**

The project has been somewhat delayed because of the involvement of the Chair in Covid modelling which had to be prioritized but progress has been made.

##### **Project 2019-019-2-700 Liebman**

The subject is: Impact of Objective Analysis of Clinical Trial Failures on Drug Discovery and Development Processes.

The members have formalized the relationship with Accelerated Cures, the patient advocacy group who has extensive data and is extending our interaction to the network of institutions and foundations. In addition, they are in discussion with the DOD and separately with the Veterans Health Administration, which is not in DOD but in HHS. Additionally they have connected with a group that is developing therapeutics and access comprehensive patient. Data have been brought in a senior data analyst.

To frame all of this the members have extended the data model and the approach for knowledge graph development. They are working with a biomarker database

#### **Project 2021-004-2-700, Templeton**

Gold Book update of terms for chemistry and human health,

The task group consists of members of each subcommittee: Gerd Schnorrenberg of DDD, Brandon Presley and John Duffus of TRA and Helle Møller Johannessen of NPU.

### **Interdivisional projects**

#### **Project 2020-016-3-020, Chiu and Cesa**

IUPAC's role in extending the global gender project: A global approach to the gender gap in mathematical and natural sciences: how to measure it, how to reduce it. This project is a cooperation of 8 Divisions.

#### **Project 2020-019-4-050, Apotheker and Saha**

Examples of the introduction of sustainable development as well as green industrial processes for secondary school chemistry and introductory chemistry, a cooperation of CCE, COCI, Chemrawn, Divisions VI & VII.

#### **Project 2020-017-2-700, Abbate**

A database of chemical structures and identifiers used in control of WADA prohibited substances, a cooperation of Divisions VII & VIII

Enhancing capabilities for the mitigation of chemical risk. The dissemination of the emergency response guidebook (ERG) in Russian-speaking countries, a cooperation of the IUPAC Chemistry and the Environment Division (VI), the Chemistry and Human Health Division (VII) and the Committee on Chemistry Education (CCE).

#### **Project 2020-020-2-600, Guidotti**

In progress

### **COMPLETED PROJECTS**

#### **Project 2016-045-2-700, Johnston**

Project is complete. A first paper has been published in NanoImpact: <https://doi.org/10.1016/j.impact.2020.100219> and a second one:

Linda J. Johnston, Norma Gonzalez-Rojano, Kevin J. Wilkinson, and Baoshan Xing, Challenges for evaluation of the safety of nanomaterials, Chemistry International, January – March 2021, pages 4 – 7

#### **Project 2019-009-1-700, Johannessen**

The project is finished, and we are working on a notice for CI. The resulting video was accepted for the Jubilee IUPAC conference in Paris. It can be viewed here: <https://www.youtube.com/watch?v=7Qw4d0uhxqQ>. It is suggested that the video technique may be useful for explanations and demonstrations of the more difficult NPU concepts.

#### **Project 2017-012-1-700, Templeton**

The project is completed. The book entitled 'Glossary of Terms Used in Molecular Toxicology' has been published by the RSC in May 2020.

#### **Project 2018-006-1-700, Balasubramanian**

Completed in 2019

#### **Project 2018-001-3-700, Fischer**

The project was completed according to schedule.

Vol-4 of Successful Drug Discovery, János Fischer (Editor), Christian Klein (Editor), Wayne E. Childers (Editor), has been published in 2019. It received a very positive review.

This book was also published in Chinese in 2021. The Chinese Publisher has purchased the license from Wiley

#### **Project 2019-021-1-700, Fischer**

The project was completed according to schedule

Vol 5 of Successful Drug Discovery, Janos Fischer, Christian Klein, Wayne E. Childers was published in February 2021

#### **Project 2000-009-1-700, Erhardt**

**Glossary and tutorial of xenobiotic metabolism terms used during small molecule drug discovery and development (IUPAC technical report), Pure and Applied Chemistry 2021.** Paul Erhardt\*, Kenneth Bachmann, Donald Birkett, Michael Boberg, Nicholas Bodor, Gordon Gibson, David Hawkins, Gabrielle Hawksworth, Jack Hinson, Daniel Koehler, Brian Kress, Amarjit Luniwal, Hiroshi Masumoto, Raymond Novak, Phillip Portoghese, Jeffrey Sarver, M. Teresa Serafini, Christopher Trabbic, Nico Vermeulen and Steven Wrighton

This project originated more than 15 years ago with the intent to produce a glossary of drug metabolism terms having definitions especially applicable for use by practicing medicinal chemists. A first-draft version underwent extensive beta-testing that, fortuitously, engaged international audiences in a wide range of disciplines involved in drug discovery and development. It became clear that the inclusion of information to enhance discussions among this mix of participants would be even more valuable. The present version retains a chemical structure theme while expanding tutorial comments that aim to bridge the various perspectives that may arise during interdisciplinary communications about a given term. This glossary is intended to be educational for early stage researchers, as well as useful for investigators at various levels who participate on today's highly multidisciplinary, collaborative small molecule drug discovery teams.

## IV Publications

Book Vol-4 of 'Successful Drug Discovery, J. Fischer, Christian Klein, Wayne E. Childers, Wiley, 2019  
This book was also published in Chinese in 2021. The Chinese Publisher has purchased the license from Wiley

Linda J. Johnston, Norma Gonzalez-Rojano, Kevin J. Wilkinson, and Baoshan Xing, Challenges for evaluation of the safety of nanomaterials, NanoImpact, 18, 100219, 2020

Book entitled 'Glossary of Terms Used in Molecular Toxicology', authors: D. Templeton, J. Duffus and M. Schwenk, published by the RSC in May 2020

Linda J. Johnston, Norma Gonzalez-Rojano, Kevin J. Wilkinson, and Baoshan Xing, Challenges for evaluation of the safety of nanomaterials, Chemistry International, January – March 2021, pages 4 – 7

Glossary of terms used in molecular toxicology, D.M. Templeton. M. Schweik, J. Duffus, Commentary by Douglas Templeton, Chemistry International, January March 2021, page 40 – 41

Book, Vol 5 of Successful Drug Discovery, Janos Fischer, Christian Klein, Wayne E Childers, 2021

Paul Erhardt\*, Kenneth Bachmann, Donald Birkett, Michael Boberg, Nicholas Bodor, Gordon Gibson, David Hawkins, Gabrielle Hawksworth, Jack Hinson, Daniel Koehler, Brian Kress, Amarjit Luniwal, Hiroshi Masumoto, Raymond Novak, Phillip Portoghese, Jeffrey Sarver, M. Teresa Serafini, Christopher Trabbic, Nico Vermeulen and Steven Wrighton,  
Glossary and tutorial of xenobiotic metabolism terms used during small molecule drug discovery and development (IUPAC technical report), Pure and Applied Chemistry 2021.



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

18.8 Division VIII Report to Council

Prof. Alan Hutton

### I. Highlights/Executive Summary

The activities of Division VIII (Chemical Nomenclature and Structure Representation) are closely aligned with IUPAC's Mission Statement, namely to "provide objective scientific expertise and develop the essential tools for the application and communication of chemical knowledge for the benefit of humankind and the world."

Due to the global Covid-19 pandemic, the Division Committee and associated task group meetings that had been scheduled to be held in Copenhagen during August 2020 had to be cancelled. A virtual Division Committee meeting was held on 19 September 2020, attended by 20 members, and reports were received for all currently active projects and plans made for future Division priorities. Unfortunately the loss of impetus imposed by the absence of physical meetings has hindered the progress of projects within the Division, as members have had to adjust to the new practice of online interactions. It is particularly in the realm of chemical nomenclature, where the minutiae of a recommendation are so important to thrash out, that the light-bulb moments occur in the back-and-forth argument. Hence progress is slower without the face-to-face meetings where the group engages in discussion in front of a whiteboard with a cup of coffee (or beer) in hand.

The Division has been hard-hit by the severe illness (since June 2019) of one of its key members, former President and current TM Karl-Heinz Hellwich, whose encyclopaedic knowledge of chemical nomenclature (and Division VIII institutional knowledge) make him a vital player in Division matters and in many task groups. We continue to wish him and his family strength and hope for a full recovery.

Several new projects have been initiated and approved since the last report, and these are briefly discussed in Section III (below). Of particular note is a new project building on our long-standing liaison with the International Organization for Standardisation (ISO): '*Nomenclature and associated terminology for inorganic nanoscale particles*'. This project is co-chaired by IUPAC and ISO representatives and the task group is composed of experts selected by the relevant ISO Technical Committees working in this area and nomenclature experts from Division VIII. The intention is to develop conventions for the clear description of inorganic nanoparticles, their modifications (surface and bulk) and populations, and there is a possibility that the resultant nomenclature may well be InChI-based. This project joins another currently active one on nomenclature for carbon nanotubes and related nanomaterials that is also in collaboration with experts from ISO.

Among other recently approved projects are '*Enhanced recognition and coding of stereoconfiguration by InChI tools*', which will provide updated procedures allowing InChI to support additional stereochemical cases and avoid mistakes in designation of stereoisomers, and '*Structure-based nomenclature for irregular linear, star, comb and brush*

*polymers with different types of constitutional repeating units (CRUs)*’, which will complement a related and recently concluded project so that polymers containing more than one type of CRU can be easily and uniquely described. Very recently a collaborative project with Division VII has been approved, namely ‘*A database of chemical structures and identifiers used in the control of WADA prohibited substances*’. The Division is currently drafting a proposal to contribute to the CPCDS project on revision of “The Gold Book”.

An important current project, ‘*Alignment of principles for specifying ligands and substituent groups across various areas of nomenclature*’, has produced a draft report of some significance, in that this project provides overarching recommendations that now allow completion of several projects in different states of progress. One such longstanding project (‘*Boron hydride nomenclature*’) has recently (February 2020) been published in *PAC*. It is expected that the other projects relying on decisions made in the ‘Alignment Project’ and mentioned in Section III below will now be more rapidly concluded.

Other recent outputs include publication of the *Dendrimers Recommendations* in March 2019, the *Lactic Acid-based Polymers Recommendations* at the beginning of 2020, along with the *Guide to Polymer Nomenclature for Authors of Papers and Reports in Polymer Science and Technology (Technical Report)*, and our *Brief Guide to the Nomenclature of Organic Chemistry (Technical Report)*, with the its handy four-page summary brochure as Supplementary Information and available for distribution. This brochure is now also available in a Danish translation. Remarkably, translations of the corresponding *Inorganic Brief Guide* (published in 2015) continue to appear and are now available in French, Basque, Danish, Dutch, Galician and Spanish, while versions in Catalan, German, Portuguese, Slovak and Thai are in preparation.

Other key priorities are to initiate a new edition of “The Red Book” (*Nomenclature of Inorganic Chemistry, IUPAC Recommendations 2005*), possibly in parallel with a new edition of our *Principles of Chemical Nomenclature*, last updated in 2011. We will continue with the revision and further development of the recommendations in “The Blue Book” (*Nomenclature of Organic Chemistry, IUPAC Recommendations and Preferred Names 2013*), and will aim to finalise and publish the several other projects that are nearing completion, as highlighted in Section III (below).

## II. Plans and priorities for remainder of this biennium and beyond

The draft report of the *Alignment of principles for specifying ligands and substituent groups across various areas of nomenclature* project, details of which are given in Section III (below), has provided the basis for the completion of several interlinked projects, as several overarching principles have now been established (and further elaborated at the Task Group meetings in Basel in August 2018 and Paris in July 2019). This should now enable rapid progress to be made, and already the boron hydride nomenclature project has been completed and recently published. A priority for this biennium and beyond will be to apply the outcomes of the ‘Alignment Project’ to complete the projects on metallacycle nomenclature, the Blue Book extension and revision, and preferred names for inorganic compounds (PINs – this means primarily the specification of ligating atoms in coordination compounds, also known as the kappa document). At the Paris meeting in July 2019 it was decided that the latter project should be incorporated into the ‘Alignment Project’, as kappa problems are similar to those encountered with other modifications of the chemical name (isotopic modifications,

etc.). It is anticipated that this will accelerate progress towards the conclusion of these projects.

Priority will be given to work on the revision of ‘The Blue Book’ (*Nomenclature of Organic Chemistry, IUPAC Recommendations and Preferred Names 2013*). Thus far the work on systematically collating the list of corrections has revealed further areas where additional discussion, unification and even extension are needed. Some of these matters have already been given a sound basis by the discussions, agreements and decisions made during the ‘Alignment Project’ meeting in London in November 2017, allowing further progress to be made at the Blue Book Task Group meetings in Basel in 2018 and Paris in 2019.

A key project still to be initiated in this biennium, and which will surely extend into the next few biennia, is to publish a new, updated version of ‘The Red Book’, *Nomenclature of Inorganic Chemistry, IUPAC Recommendations 2005*. Completely new chapters on solids, boron hydrides, organometallic compounds and other topics are envisaged; fortunately several currently extant projects will feed directly into the new book. This endeavour will probably be funded initially as several smaller projects, culminating in a concluding project to compile and edit the final book. Discussions in Paris in July 2019 resulted in a first draft of the likely contents and expressions of interest from those likely to take part. The next step is to form a subcommittee to oversee this major undertaking.

The discussions in Paris in July 2019 also identified the need for an updated version of *Principles of Chemical Nomenclature*, last published as the 2<sup>nd</sup> edition in 2011. As chemical nomenclature becomes broader and more complex, a more accessible and popular exposition of IUPAC recommendations, such as that provided by *Principles*, becomes invaluable in chemistry education and public understanding. Current thinking is that this would run as a project in parallel with a revision of ‘The Red Book’.

Several long-running projects are nearing completion (these are discussed in Section III, below) and it will be a priority in the remainder of this biennium to bring these to a conclusion. A complete list of currently active projects can be found in the tabular material at the end of this report (Section IV.2).

Superimposed on the priorities mentioned above are the participation and commitment required of the Division to contribute to the CPCDS project on ‘*Development of an IUPAC Recommended Term Management System for Expansion of the Coverage of the IUPAC Compendium on Chemical Terminology*’, the so-called ‘Gold Book’ project. In this the Division will be required to review and, if necessary, update all current entries in the ‘Gold Book’ relevant to the Division and also scan more recent IUPAC Recommendations for further entries or to revise existing entries. The Division is in the process of developing a project proposal to facilitate this.

The next meeting of the Division VIII Committee, preceded by various associated Task Group Meetings, was scheduled to take place at the 51<sup>st</sup> IUPAC General Assembly in Montreal in August 2021. Regrettably, due to the travel and physical restrictions imposed by the current global Covid-19 pandemic, these meetings will now take place online at the virtual General Assembly platform that is being arranged to replace the physical meeting.

### III. Overall report of Division activities and achievements during the later part of the 2018-2019 biennium and through 2020 organized by the Goals and Objectives laid out in the current IUPAC Strategic Plan

#### GOALS

##### *Provide scientific expertise to address critical world needs*

A full list of currently active projects can be found in Section IV (below). These projects provide the scientific expertise to name chemical substances – whether this addresses a critical world need is debateable, but it is certainly at the core of IUPAC activities, and is most likely the one most frequently associated with IUPAC. There is no doubt that for the international exchange of goods, and in particular chemicals, an unambiguous and global nomenclature and classification is a critical requirement for transportation and import/export authorities.

In the later part of the 2018-2019 biennium and through 2020 several **new projects** were approved and work has started on these:

- *Revision and integration of the carbohydrate related recommendations on Glycoconjugates and Glycoinformatics* (Chair: Vliegenthart). This is an extension of a previous project which has made substantial progress, but the extent of the undertaking was clearly underestimated in the original proposal and there are currently several strands which need to be drawn together to provide an authoritative, integrated and overarching document.
- *Alignment of principles for specifying ligands and substituent groups across various areas of nomenclature* (Chair: Hellwich, now Damhus). The intention of this project was to provide the basis for completion of several projects that were at different stages, but could not be completed because of their reliance on the conclusions of each other:
  - Boron hydride nomenclature (2012-045-1-800)
  - Metallacycles nomenclature (2013-030-1-800)
  - Preferred names for inorganic compounds, PINs (kappa document) (2006-038-1-800)
  - Blue Book revision and extension (2015-052-1-800)

by reaching a consensus on:

- the grouping of substituents or ligands with different kinds of modifications
- the alphabetical order of substituents or ligands with different kinds of modifications
- the positioning of locants in chemical names
- the positioning of kappa terms in chemical names

The project comprised one meeting held in London in November 2017 and has thus far resulted in a draft report; this was reviewed and further work done at a Task Group meeting in Basel in August 2018.

An outcome of task group meetings held before the GA in Paris in July 2019 was the decision to incorporate the PINs (kappa document) project (2006-038-1-800) into the overarching Alignment project (2017-033-1-800) under the new chairmanship of Ture Damhus. The intention is to publish a summary report in *Chemistry International* and then a Recommendation in *PAC*. Already a successful outcome of the project is that the document on boron hydride nomenclature was able to be finalised and has now been published.

A short summary of the aims of the Alignment project was published in *Chem. Int.* **40**(3), 30 (2018).

- *Graphical representation standards for chemical reaction diagrams* (Chair: Taylor). This project will provide a single, comprehensive set of guidelines for creating chemical reaction diagrams in printed and in electronic media. The recommendations will incorporate and complement previous IUPAC projects on graphical representation standards. In Paris a draft document was made available.
- *Graphical representation of polymer structures* (Chair: Hellwich, now Yerin). This project had the first task group meeting in June 2018. It intends to provide a single and comprehensive set of guidelines for the graphical representation of polymer structures, again incorporating and complementing the work done in previous projects. Due to the indisposition of Karl-Heinz Hellwich, Andrey Yerin will now chair this task group.
- *Nomenclature and associated terminology for inorganic nanoscale particles* [Co-chairs: Constable (IUPAC)/Brown (ISO)]. This project will begin the development of a framework for the nomenclature of inorganic particles, building upon and refining existing principles derived from polymers, ongoing efforts on carbon nanotubes, ISO terminology, and opportunities with InChI, in addition to developing new frameworks for future materials. The intention is to develop conventions for the clear description of inorganic particles, their modifications (surface and bulk) and populations. The task group comprises members from IUPAC, ISO and relevant technological industries.
- *Enhanced recognition and coding of stereoconfiguration by InChI tools* (Chair: Yerin). InChI tools are widely used as substance identifiers in various sources of chemical information. However, the current support of stereochemical information is limited to tetrahedral, double bond and short allene stereoisomerism. Among the unsupported stereo types are atropisomers and some special cases including centers with more than four ligands. An additional significant problem is an incomplete recognition of configurations for very common Haworth and chair representations of carbohydrates. Updated procedures will allow InChI to support additional stereochemical cases and avoid mistakes in designation of stereoisomers.
- *Structure-based nomenclature for irregular linear, star, comb and brush polymers with different types of constitutional repeating units* (Chair: Chen). This project is intended as a complement to the project ‘Structure-based nomenclature for regular linear, star, comb and brush polymers’ (2013-031-3-800), which provides guidelines for the nomenclature of linear and branched polymers with three or more blocks that are of identical constitutional repeating units (CRUs). This new

project will provide guidelines for the nomenclature of the same type of polymers but, importantly, it will extend the nomenclature so that polymers containing more than one type of CRU can be easily and uniquely described.

- **Other new projects** of relevance to Division VIII that were initiated in the later part of the 2018-2019 biennium and through 2020 are:
  - \* *Chemical and Biochemical Thermodynamics Reunification* (Chair: Iotti).
  - \* *Digital Dissemination of Data Standards: Planning for a new Cheminformatics Color Book* (Chair: McEwen).
  - \* *IUPAC100 Periodic Table Competition* (Chair: Apotheker).
  - \* *International Year of the Periodic Table of Chemical Elements (IYPT) in 2019: planning, coordination and implementation* (Chair: Tarasova).
  - \* *InChI Open Education Resource* (Chair: Belford).
  - \* *Building Broader and Deeper Links Between OPCW and IUPAC* (Chair: Hartshorn/Forman).
  - \* *Terminology of polymer aggregates* (Chair: Nakano).
  - \* *Nomenclature of sequence-controlled polymers* (Chair: Théato).
  - \* *A database of chemical structures and identifiers used in the control of WADA prohibited substances* (Chair: Abbate)

Several projects have been **finalized** or are in the **final stages** of preparation:

- *Dendrimers with regular dendrons and hyperbranched polymers*. Recommendations for the nomenclature and terminology of these were published in *PAC* early in 2019.
- *Boron hydride nomenclature*. As mentioned above, as a result of the Alignment Project meeting in London in November 2017 and follow-up meetings in Basel in August 2018 and Paris in 2019 this document has been finalised, reviewed and was published in *PAC* early in 2020.
- *Hyphenation of chemical names*. This document, which addresses the needs expressed in discussions with De Gruyter's production department, was published in *PAC* early in 2021.
- *Inorganic and Organic Brief Guides*. The *Inorganic Brief Guide* was published in 2015. Its French translation has been prepared with the help of Division VIII and was published at the end of 2019 (see list of publications in Section IV.3). Translations are also available in the Basque, Danish, Dutch, Galician and Spanish languages. Versions in Catalan, German, Portuguese, Slovak and Thai are in preparation. The *Organic Brief Guide* was published in *PAC* early in 2020, and has already been translated into Danish. Both *Guides* were presented as posters at the 'Speed Networking' event at the GA in Paris in 2019.

- *Nomenclature and terminology for linear lactic acid-based polymers* (administered through Division IV) has been finalized, reviewed and was published in *PAC* early in 2020.
- *A concise guide to polymer nomenclature for authors of papers and reports in polymer science and technology* (administered through Division IV) has been finalized, reviewed and was published in *PAC* early in 2020.
- A document on *Stereochemical definitions and notations relating to tactic polymers* underwent Division, ICTNS and public review and was published in *PAC* towards the end of 2020.
- A document on *Nomenclature and terminology for star, comb and brush polymers* has completed the review processes and is currently in press (*PAC*).
- A document on *Terminology and nomenclature for conjugates based on polymers or other substrates* was reviewed by Divisions IV and VIII and is currently under review with ICTNS.
- A document on *QR codes and industry applications (identifying InChI enhancements)* has been finalized and is currently under review.

The outputs of the **seven completed projects** for the later part of the 2018-2019 biennium and through to early 2021 mentioned above have been published in *PAC* and are given full references in the publication listing to be found in the tabular material at the end of this report (Section IV.3).

The Division continues to support the development of the International Chemical Identifier (InChI). The Subcommittee on the IUPAC International Chemical Identifier is the body responsible for the scientific activities supported by the InChI Trust. It reports to Division VIII and to the Committee on Publications and Cheminformatics Data Standards (CPCDS). A joint session of the InChI Subcommittee with the Division VIII Committee at the GA in Paris in July 2019 was held, at which the chair of the InChI Subcommittee, Steve Heller, gave an update on the latest developments. The activities of the InChI Subcommittee address the critical world need for chemical information to be codified and digitized.

### ***Increase the value of our products and services***

By condensing the essential elements of chemical nomenclature into the ‘Brief Guides’ (Polymer, Inorganic, and newly published Organic), we are increasing the value of our efforts in nomenclature by making them available in simplified form to students and authors. Moreover, the value of these outputs is substantially increased by their translation into other languages, for example, the *Inorganic Brief Guide* is now available in French, Basque, Danish, Dutch, Galician and Spanish, while versions in Catalan, German, Portuguese, Slovak and Thai are in preparation. The *Organic Brief Guide* has recently been translated into Danish.

Revisiting and revising existing IUPAC nomenclature principles and rules as the science of chemistry develops and new classes of compounds are discovered clearly increases the value of our endeavours.

### ***Improve the vitality, effectiveness and efficiency of our Union***

One aspect of efficiency is certainly if new project task groups and in particular task group chairs familiarise themselves with relevant existing IUPAC guidelines and recommendations and apply them early on in new drafts. The goal must be consistency and uniformity between the different disciplines within chemistry and IUPAC.

Ongoing Division input into the discussions around the report of the Organizational Structure Review Group made available to Bureau towards the end of 2020 will contribute to a new governance structure for IUPAC, an activity which certainly falls under the heading of this subsection of the IUPAC Goals.

## **OBJECTIVES**

### ***Brand IUPAC in the minds of stakeholders***

*and*

### ***Improve quality and frequency of communication with stakeholders***

Several of the publications listed in Section IV.3 (below) are in *Chemistry International* and provide communication channels both within the IUPAC community and to the larger stakeholder base. Often the articles in *Chemistry International* trigger users to consult the latest Recommendations as published in PAC, or to turn to the latest edition of any of the ‘Colour Books’.

Distribution of the ‘Brief Guides’ at conferences and to students and schools and universities, either in hard or electronic copy, also fulfils this objective, as does the presentation of posters on nomenclature at conferences – this was done on several occasions for the Boron Hydride project, and the Lactic Acid Polymers project was presented at a conference in May 2019. Both the *Inorganic* and *Organic Brief Guides* were presented at the ‘Speed Networking’ event at the GA in Paris in July 2019.

Our objective of having publishers reproduce the ‘Brief Guides’ in their text books is slowly being realised, and Pearson has published the *Inorganic Brief Guide* as an appendix in the recent 5<sup>th</sup> edition (2018) of *Inorganic Chemistry* by Housecroft and Sharpe.

Obviously, translations of, for example, the ‘Brief Guides’, as highlighted elsewhere in this report, improve both the quality and frequency of communication with stakeholders, and additionally brand IUPAC in the minds of a wider community of stakeholders.

In 2019 Division VIII supported and contributed to the budget of two ‘International Year of the Periodic Table’ projects which strongly promoted IUPAC branding and communication.

### ***Increase revenue***

No input here unless IUPAC receives royalties from the sale of our ‘Colour Books’. Some revenue may be realised indirectly by our distribution of the ‘Brief Guide’ series which references (with hyperlinks) the IUPAC publications.

### ***Expand and retain member and volunteer base with an emphasis on diversity and inclusion***

The current Division VIII Committee (see membership list in tabular material at the end of this report, Section IV.1) of 26 elected or appointed members comprises 17 males and 9 females (TMs: 7 male, 3 female; AMs: 4 male, 2 female; NRs: 6 male, 4 female). Our current Vice President is female and will become President from 2022. There is a reasonable geographical spread, though amongst the TMs and AMs the members are mainly based in Europe or North America. This is probably a reflection of where the expertise in chemical nomenclature has traditionally resided, and efforts must be made to recruit and train members from, in particular, the Far East, Australasia, South America and Africa. We are fortunate to have Committee Members not only from academia, but also from research institutions, the industrial sector, as well as CAS and CCDC.

The recently instituted ‘Emeritus Fellows’ programme can be seen not only as a way of honouring those deserving special recognition, but also retaining their expertise and involvement once no longer eligible for re-election. The Division Committee approved the appointment of three Emeritus Fellows at its meeting in Paris in July 2019: Alan McNaught (UK), Warren Powell (USA) and Jeff Leigh (UK).

### ***Enhance interdivisional interaction and collaboration***

Members of Division VIII have been involved in projects administered through the Inorganic Chemistry Division (II), Organic and Biomolecular Chemistry Division (III), and Polymer Division (IV), as well as the IUBMB-IUPAC Joint Commission on Biochemical Nomenclature (JCBN). Such collaboration with other Divisions and also other organisations is essential and functionally important, because work on nomenclature must necessarily progress through interactions of nomenclature specialists with discipline specialists. Currently several Division VIII Committee members are also members of the Subcommittee on Polymer Terminology (SPT), others are involved in projects administered through Division IV, and three Division Committee members (besides the JCBN Chairman who is an *ex officio* member of our Division Committee) are also Associate Members of JCBN. There is also cross-membership with Divisions II and III. Division VIII looks forward to further cross-fertilisation of ideas and activities through these interactions.

Most recently an initiative has been started towards a closer collaboration with CPCDS because of the overlap of interests and responsibilities in the area of structure representation. In this regard a decision was taken at the Division VIII committee meeting in Paris in July 2019 to include the Chair of CPCDS as an *ex officio* member of the Division VIII committee. One possible initiative is a proposal to develop jointly a Unicode character set for chemistry.

### ***Emphasize multidisciplinary projects addressing critical global issues***

Further development of the International Chemical Identifier (InChI) involves multidisciplinary computer scientists and information specialists.

The Division has also been developing closer contacts with organisations which are or will be users of chemical nomenclature. For example, our participation in the IUPAC delegation to the 4<sup>th</sup> Review Conference of the Organisation for the Prohibition of Chemical Weapons (OPCW) in The Hague in November 2018, with follow-up meetings at the Paris GA in July 2019, could result in a collaborative project with OPCW. This kind of cooperation towards the mutual goal of the peaceful use of chemistry surely epitomizes a project addressing critical global issues.

Links with the International Organisation for Standardisation (ISO) resulted in a challenging and yet promising project on developing nomenclature for carbon nanotubes and related nanomaterials. Our new project on inorganic nanoscale particles is now up and running and is jointly chaired as a collaboration between IUPAC and ISO. Established contacts with the Cambridge Crystallographic Data Centre (CCDC) and the European Patent Office offer further avenues for multidisciplinary projects.

### ***Support chemistry education, particularly in developing countries***

The *Brief Guide to the Nomenclature of Inorganic Chemistry* summarizes the topic in four pages and was published in *PAC* in October 2015. It is aimed at advanced high school pupils or early undergraduate students and is also a handy reference for postgraduate researchers. Its success can be judged from the fact that translations of this document into several languages have already been completed. Translations are now available in French, Basque, Danish, Dutch, Galician and Spanish; versions in Catalan, German, Portuguese, Slovak and Thai are in preparation. More recently, reprints and posters have been prepared for distribution and presentation at relevant conferences or congresses. The publishing house Pearson has included it as an appendix in the recently published 5<sup>th</sup> edition (2018) of *Inorganic Chemistry* by Housecroft and Sharpe.

The corresponding four-page *Brief Guide to the Nomenclature of Organic Chemistry* has recently been published (early 2020) and has already been translated into Danish. These 'Brief Guides' should be thought of as quick references and can easily and freely be republished or included in Author Guidelines and textbooks. The *Brief Guide to the Nomenclature of Polymers* is now due for revision, as a number of new polymer nomenclature documents have appeared since its publication in 2012, and it is intended to initiate this process in the current biennium. There is currently discussion about a similar four-page *Brief Guide to Biochemical Nomenclature*, which would be undertaken in collaboration with JCBN.

Another contribution under the heading of chemistry education is the more popular exposition of IUPAC nomenclature recommendations as provided by the book *Principles of Chemical Nomenclature*, the 2<sup>nd</sup> edition of which was published in 2011. At the Division Committee meeting in Paris in July 2019 it was decided that a new, updated edition was now desirable, and the way forward for this as a project will be pursued in the later part of the current biennium.

Division VIII supported and contributed to the budget of two 'International Year of the Periodic Table' (IYPT) projects in 2019, which will have had obvious impact on chemistry education.

### **Acknowledgement**

The help and advice of Division Secretary Risto Laitinen in the compilation of this report is gratefully acknowledged.

## IV. Tabular material

### 1. DIVISION VIII MEMBERSHIP 2020 – 2021

Name	Status	Term	NAO
Prof. Alan T. Hutton	President	2018-2021	South Africa
Dr. Michelle Rogers	Vice-President	2020-2021	USA
Prof. Risto S. Laitinen	Secretary	2020-2023	Finland
Prof. Michael A. Beckett	TM	2020-2021	United Kingdom
Prof. Edwin Constable	TM	2020-2021	Switzerland
Dr. Karl-Heinz Hellwich	TM	2020-2021	Germany
Dr. Elisabeth Mansfield	TM	2020-2021	USA
Prof. Ebbe Nordlander	TM	2020-2021	Sweden
Prof. Amélia Pilar Rauter	TM	2020-2021	Portugal
Prof. Jiří Vohlídal	TM	2020-2021	Czech Republic
Prof Neil Burford	AM	2020-2021	Canada
Dr. Thomas Engel	AM	2020-2021	Germany
Prof. Robin Macaluso	AM	2020-2021	USA
Dr. Erik Szabo	AM	2020-2021	Slovakia
Prof Augusto Tomé	AM	2020-2021	Portugal
Dr. Clare A. Tovee	AM, <i>CCDC rep.</i>	2020-2021	United Kingdom
Dr. Maria Atanassova Petrova	NR	2020-2021	Bulgaria
Dr. Ture Damhus	NR	2020-2021	Denmark
Prof. Safiye Erdem	NR	2020-2021	Turkey
Mr. Adeyinka Fasakin	NR	2020-2021	Nigeria
Prof. Rafał Kruszyński	NR	2020-2021	Poland
Dr. Ladda Meesuk	NR	2020-2021	Thailand
Prof. József Nagy	NR	2020-2021	Hungary
Prof. Dušan Sladić	NR	2020-2021	Serbia
Ms. Molly Strausbaugh	NR, <i>CAS rep.</i>	2020-2021	USA
Prof. Guoqiang Yang	NR	2020-2021	China
Prof. Richard M. Hartshorn	<i>Ex officio (Sec Gen)</i>	2020-2021	New Zealand
Dr. Steve Heller	<i>Ex officio (InChI)</i>	2020-2021	USA
Leah R. McEwen	<i>Ex officio (CPCDS)</i>	2020-2021	USA
Dr. Gerard P. Moss	<i>Ex officio (JCBN)</i>	2020-2021	United Kingdom
Prof. G. Jeffery Leigh	<i>Emeritus Fellow</i>	2020-2021	United Kingdom
Dr. Alan McNaught	<i>Emeritus Fellow</i>	2020-2021	United Kingdom
Dr. Warren Powell	<i>Emeritus Fellow</i>	2020-2021	USA

## 2. CURRENTLY ACTIVE DIVISION VIII PROJECTS

Number	Chair	Short Title	Comments
2003-045-3-800 Town		Graphic Representation Standards	see 2012-033-1-800 below revive to be closed and revived as new project by Rauter to be merged with 2017-033- 1-800 Alignment of principles (Damhus) Owen new Chair - reactivate
2004-024-1-800 Moss		JCBN Cyclic Peptides	
2006-019-1-800 Dixon† (Moss)		JCBN Phosphorus Compounds	
2006-038-1-800 Hartshorn (Damhus)		Inorganic PINs/Kappa Convention	
2009-022-2-800 Cammack/Ennis (Owen)		JCBN Biologically Important Small Molecules	
2009-040-2-800 Batchelor		InChI Organometallic Compounds	ongoing
2009-041-1-800 Goncharoff		InChI Markush Structures	no feedback
2009-042-1-800 Yerin		InChI Polymers	
2009-043-2-800 Grethe		InChI Reactions	
2011-035-1-800 Jones		Inorganic Polymers (TINCOPS)	Öhrström acting Chair document exists, errata needed document expected
2011-044-1-300 Brimble		Abbreviations for Protecting Groups	
2012-023-2-800 Nicklaus		InChI Tautomerism	
2012-033-1-800 Town		Graphic Representation of Reactions	see 2017-036-2-800 below
2012-037-1-800 Yerin		Hydrogenation (Hydro Prefixes/Indicated H)	nearly ready for review
2012-039-2-800 Vliegthart		JCBN Carbohydrate Nomenclature	see 2015-035-2-800 below
2012-046-2-800 Rey (Hartshorn)		InChI Inorganic	transfer to new Chair
2013-010-1-800 Taylor		InChI Biomolecules	possibly close this project
2013-030-1-800 Hutton		Metallacycles	ongoing
2013-031-3-800 Chen		Star Polymers	in press ( <i>PAC</i> )
2013-056-1-800 Mansfield		Carbon Nanotubes	draft document available
2014-001-2-200 Öhrström		Topology of Metal-Organic Frameworks	ongoing
2015-003-2-300 Reaney		Homodetic Cyclic Peptides	no feedback – report from Rauter?
2015-019-2-800 Hartshorn		InChI QR-Code Extension	in review
2015-025-4-800 McEwen		InChI Mixtures	ongoing
2015-035-2-800 Vliegthart		JCBN Carbohydrates [Project extension]	see 2017-026-1-800 below
2015-052-1-800 Hellwich (Moss)		Blue Book Extension and Revision	ongoing (Moss now Chair)
2015-053-1-200 Macaluso		Solid State Terminology	ongoing – draft in progress
2017-026-1-800 Vliegthart		JCBN Carbohydrates [Project extension]	ongoing
2017-033-1-800 Hellwich (Damhus)		Alignment of Nomenclature Principles	to be merged with 2006-038- 1-800 Inorganic PINs (Damhus)
2017-036-2-800 Taylor		Graphic Representation of Reactions	draft document available
2017-039-2-800 Hellwich		Graphic Representation of Polymers	ongoing – Yerin to Chair
2018-012-3-024 Belford		InChI Open Education Resource	ongoing
2019-016-3-800 Constable/Brown		Inorganic Nanoscale Particles	ongoing project with ISO
2019-017-2-800 Yerin		Stereoconfiguration Using InChI Tools	ongoing
2019-036-1-800 Chen		Star, Comb, etc. Polymers with Different CRUs	ongoing
<b>Also relevant to Division VIII:</b>			
2014-034-2-400 Vert		Polymeric Conjugates	in ICTNS review
2016-046-1-024 Chalk		IUPAC Gold Book Website	ongoing
2017-011-3-024 McEwen		Planning Cheminformatics Colour Book	ongoing

*Continued...*

2017-021-2-100 Iotti	JCBN Thermodynamics Reunification	ongoing
2019-014-2-400 Nakano	Terminology of Polymer Aggregates	ongoing
2019-041-3-400 Théato	Nomenclature of Sequence-controlled Polymers	ongoing
2020-017-2-700 Abbate	Database for WADA Prohibited Substances	new (9 Nov 2020)

### 3. PUBLICATIONS RELATED TO DIVISION VIII SINCE LAST GA (PARIS, AUGUST 2019)

#### Recommendations and Technical Reports

A. Fradet, J. Chen, K.-H. Hellwich, K. Horie, J. Kahovec, W. Mormann, R. F. T. Stepto, J. Vohlídal, E. S. Wilks, Nomenclature and terminology for dendrimers with regular dendrons and for hyperbranched polymers (IUPAC Recommendations 2017), *Pure Appl. Chem.* **91**(3), 523 – 561 (2019), <https://doi.org/10.1515/pac-2016-1217>.

M. Vert, J. Chen, K.-H. Hellwich, P. Hodge, T. Nakano, C. Scholz, S. Slomkowski, J. Vohlídal, Nomenclature and terminology for linear lactic acid-based polymers (IUPAC Recommendations 2019), *Pure Appl. Chem.* **92**(1), 193 – 211 (2020), <https://doi.org/10.1515/pac-2017-1007>.

M. A. Beckett, B. Brellocks, I. T. Chizhevsky, T. Damhus, K.-H. Hellwich, J. D. Kennedy, R. Laitinen, W. H. Powell, D. Rabinovich, C. Viñas, A. Yerin, Nomenclature for boranes and related species (IUPAC Recommendations 2019), *Pure Appl. Chem.* **92**(2), 355 – 381 (2020), <https://doi.org/10.1515/pac-2018-0205>.

K.-H. Hellwich, R. M. Hartshorn, A. Yerin, T. Damhus, A. T. Hutton, Brief guide to the nomenclature of organic chemistry (IUPAC Technical Report), *Pure Appl. Chem.* **92**(3), 527 – 539 (2020), <https://doi.org/10.1515/pac-2019-0104>.

P. Hodge, K.-H. Hellwich, R. C. Hiorns, R. G. Jones, J. Kahovec, C. K. Luscombe, M. D. Purbrick, E. S. Wilks, A concise guide to polymer nomenclature for authors of papers and reports in polymer science and technology (IUPAC Technical Report), *Pure Appl. Chem.* **92**(5), 797 – 813 (2020), <https://doi.org/10.1515/pac-2018-0602>.

C. M. Fellows, K.-H. Hellwich, S. V. Meille, G. Moad, T. Nakano, M. Vert, Definitions and notations relating to tactic polymers (IUPAC Recommendations 2020), *Pure Appl. Chem.* **92**(11), 1769 – 1779 (2020), <https://doi.org/10.1515/pac-2019-0409>.

A. J. Dijkstra, K.-H. Hellwich, R. M. Hartshorn, J. Reedijk, E. Szabo, End-of-line hyphenation of chemical names (IUPAC Recommendations 2020), *Pure Appl. Chem.*, **93**(1), 47 – 68 (2021), <https://doi.org/10.1515/pac-2019-1005>.

## Other relevant publications

J. Capitolis, S. Delacroix, X. Frogneux, É. Medina, N. Rey, L. Tinat, S. Carencio, Précis de nomenclature en chimie inorganique, *Actual. Chim.* No. 437, 12 – 17 (2019), [French translation of the Brief Guide to the Nomenclature of Inorganic Chemistry in: *Pure Appl. Chem.* **87**(9-10), 1039 – 1049 (2015)]; <http://www.lactualitechimique.org/Precis-de-nomenclature-en-chimie-inorganique>.

G. J. Leigh, IUPAC and the Periodic Table, *Chem. Int.* **41**(1), 6 – 9 (2019), <https://doi.org/10.1515/ci-2019-0102>.

E. Scerri, Looking backwards and forwards at the development of the Periodic Table, *Chem. Int.* **41**(1), 16 – 20 (2019), <https://doi.org/10.1515/ci-2019-0104>.

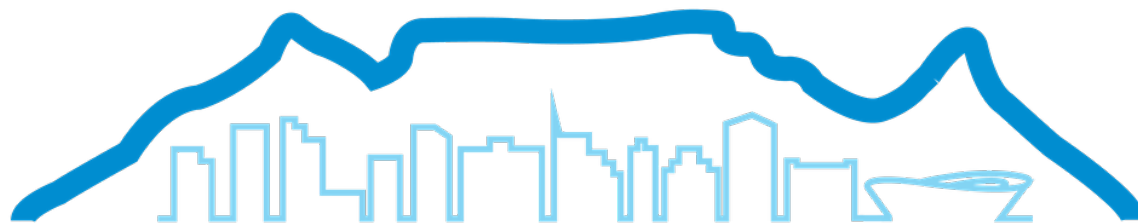
G. J. Leigh, A history of CNIC, *Chem. Int.* **41**(3), 39 – 43 (2019), <https://doi.org/10.1515/ci-2019-0313>.

E. Hepler-Smith and L. McEwen, A century of nomenclature for chemists and machines, *Chem. Int.* **41**(3), 46 – 49 (2019), <https://doi.org/10.1515/ci-2019-0315>.

L. R. McEwan, Towards a digital IUPAC, *Chem. Int.* **42**(2), 15 – 17 (2020), <https://doi.org/10.1515/ci-2020-0203>.

E. C. Constable, R. M. Hartshorn, C. E. Housecroft, 1,1'-Biisoquinolines – neglected ligands in the heterocyclic diimine family that provoke stereochemical reflections, *Molecules* **26**(6), 1584 – 1609 (2021), <https://doi.org/10.3390/molecules26061584>.

**Report to the bureau 2020**  
**Committee on Chemistry Education**  
**Jan Apotheker**  
**April 2021**



**ICCE 2022 Cape Town, South Africa 18-22 July 2022**  
**[www.ICCE2022.org.za](http://www.ICCE2022.org.za)**

### **1. Highlights and Executive Summary**

Due to COVID-19 CCE has decided to postpone the bi-annual ICCE for two years, to July 2022.

The ICCE will now be held 18-22 July 2022. That means that we skip two years. In 2024 and 2026 the ICCE will be held in Bangkok and Kiel. Which year in Kiel and which year in Bangkok still needs to be determined, and will be decided during the CCE meeting in 2022.

The 2021 meetings of CCE will be virtual in early April and during the GA in August.

Elections for a new chair and secretary are being held in March 2021. The current chair and secretary will step down at the end of 2021.

Meetings have been held virtually, using 'gotomeeting'. The main problem is the time difference between New Zealand and the west coast of the USA/ Canada. It is not really possible to plan a meeting at a reasonable time for all.

For Chemistry Teacher International this was solved by organizing two meetings, one at 09:00 CET and one at 14:00 CET.

### **Projects**

CCE has participated in a number of projects, and is leading in some.

#### **The Periodic Table Challenge**

The IUPAC periodic Table Challenge (project 2020-004-1-050) is an eye catcher. After the International Year of the Periodic Table it was decided to continue the Challenge through the website of IUPAC. It is now available in English (42830 participants), Chinese (3375 participants), Spanish (2119 participants) Arabic (1132 participants), Russian (39 participants). Within a short time Italian and French will also be available.

In total the challenge had players from 135 countries, 14 k players took part in 2020, 12k certificates were issued.

#### **Chemistry Teacher International**

The journal is now in its third year; in March, 2021 issue 3.1 was published with 15 articles. The special issue with Division IV, that experienced serious delay due to problems with finding reviewers was published June 30, 2021. The Journal has applied for status as an emerging journal, the first step towards a Social Science Citation Index. The journal was accepted within SCOPUS.

The journal now has an editorial board consisting of Jan Apotheker, editor in chief (the Netherlands) ; Rachel Mamlok (Israel) (vice chief editor); Suzanne Boniface (New Zealand), Mei-Hung Chiu (Chinese Taipei), Marietjie Potgieter (South Africa), Ethel Orlandi (Puerto Rico, representative of CPCDS), Ian Butler (Canada), Iwona Maciejowska (Poland), Alejandra Suárez (Argentina). The board meets about every two months. A quarterly meeting with CPCDS and DeGruyter has been set up.

### **Systems Thinking in Chemistry for Sustainability (STCS2030+)**

The new project on systems thinking for sustainability (Project 2020-014-3-050) has started successfully and is co-chaired by Peter Mahaffy (Canada), Stephen Matlin (UK) and representatives of the Committee on Chemistry Education (Marietjie Potgieter - South Africa), Committee on Chemistry and Industry (Bipul Saha - India) and Interdivisional Committee on Green Chemistry for Sustainable Development (Aurelia Visa - Romania). The project is conducting its business through working groups that meet biweekly to address the three main objectives envisioned for the project:

- Working Group 1 is focused on highlighting and supporting chemistry education's contributions to strengthening the centrality of chemistry as a sustainability science. They will engage with IYBSD 2022 to incorporate ST as a fundamentally important approach to support integrating human needs and science in the service of planetary sustainability. Jane Wissinger (USA; ICGCSD) co-facilitates this working group along with Sarah Cornell (Sweden) from the Stockholm Resilience Centre.
- Working Group 2 will (a) formulate IUPAC recommendations to guide use of ST in chemistry education; and (b) suggest ways to catalyze partnerships to develop practical materials, examples and tools using ST approaches to support teaching, learning, curriculum development and assessment. Marietjie Potgieter and Aurelia Visa co-facilitate this working group, and Felix Ho (Sweden; CCE) is a member of the group.
- The membership of Working Group 3, which focuses on systems thinking and chemical industry, is being organized. Bipul Saha and Jean Pelin (France; COCI) will be key members of this Working Group.

### Priorities for CCE in the biennium 2020/2021

The CCE priorities for 2020/2021 biennium are the same as those for the previous biennium:

- To develop relationships for working collaboratively with groups both inside and outside of IUPAC;
- To emphasize the importance of high-quality student-centered learning practices as well as identifying and discussing learning outcomes in chemistry education;
- To emphasize the importance of using evidence-based practice and reflective approaches in teaching and learning of chemistry;
- To encourage enthusiasm for teaching in the areas of chemistry and the use of technology in chemistry education;
- To continue supporting initiatives that raise awareness, social responsibility, and understanding the nature of science as well as of environmental and ethical issues that are related to chemistry;
- To initiate programs on promoting chemistry education and public understanding of chemistry for developing countries;
- To create resources to support high quality research and practice, and to disseminate the outcomes of research in chemistry education.
- Creating professional learning communities (PLCs) of chemistry teachers, via websites, skype conversations, and other electronic means.

CCE is involved in a number of projects linked to these goals.

### Projects

CCE is involved in a number of projects. Sometimes as participants, in other cases CCE is involved in the leadership.

Projects that were completed in the 2020/2021 biennium are:

	Project Numbers and chair	Total Project Budget	Status
1	2018-015-2-050 Kamata	\$ 5.000	Completed
2	2018-040-3-050 Ochirkhuayg	\$4,500.00	completed
3	2018-005-2-020 Reedijk	\$3,000.00	September 2020
4	2017-031-1-050 Apotheker	\$1,800.00	January 2020

1. The YAC in Mongolia was held in September 2019. A more complete report was published in CI

2. The FCEP program in Mongolia was held in September 2019, together with the YAC. A more complete report was published in CI.

3. This dealt with the International Year of the Periodic Table, in which CCE participated. The final report was published recently.

4. This the project concerning the Periodic Table challenge. This was concluded February 1, but will continue on the IUPAC website. A more complete report will be published in CI.

Open projects (led by CCE) are given in table 1.

:

Table 1.

	Project Numbers and chair	title	Status
1	2019-039-3-050 Chan/ Apotheker	Special issue of Chemistry Teacher	Will be completed in 2021

		International in Polymer Sciences	
2	2020-004-1-050 Meija/ Apotheker	IUPAC Periodic Table Challenge 2.0	completed
3	2020-014-3-050 Mahaffy	Systems Thinking in Chemistry Education for Sustainability: Toward 2030 and beyond	Until 2024
4	2020-019-4-050 Apotheker	Examples of the introduction of sustainable development as well as green industrial processes for Secondary School Chemistry and Introductory Chemistry	Late 2021

The second IUPAC-funded STICE project (STCS 2030+) started in October 2020 with the formation of a steering group consisting of the co-chairs of the project (Mahaffy & Matlin) and three representatives, one each from CCE, COCI and ICGCSD. This steering group laid the ground work for the formation of three working groups which will focus on the three objectives of the project. Details were given above.

CCE is participating in a number of other projects, led by other divisions/ standing committees. This list is given in Table 3.

CCE is planning another Young Ambassadors for Chemistry Project in Cape Town in July 2022.

Work is in progress for a FCEP for Nepal.

## **2. Plans and priorities for this biennium and beyond. /3. An overall report on activities and achievements during the 2020/2021 biennium**

### **Conferences**

For the next biennium CCE will continue to work on its priorities by organizing conferences on Chemistry Education. The 26<sup>th</sup> ICCE will be held in Cape Town. Because of the corona virus this conference was postponed until July 2022. It will be held from January 26 till January 30 2021.

The 2024 conference is planned in Bangkok, Thailand. In 2026 we have plans for Kiel Germany.

### **Other conferences.**

We will support the conferences to be held in Africa, Asia and Europe. The European Conference of Research in Chemistry Education will be postponed to July 2022. The Asian conference NICE is still planned for later this year. The fifth African Conference of Research In Chemistry Education will be held in Cairo, Egypt in January 2022.

### **FCEP and YAC**

#### **Future**

A YAC is planned in conjunction with the 26<sup>th</sup> ICCE in Cape Town. Since that conference has been postponed plans will change slightly.

We are planning to organize a YAC for the WCC in The Hague in 2023 as well.

The FCEP takes more organizing. We are in contact with Nepal and discussions are in progress about the introduction of microscale chemistry in Nepal.

### **Projects**

#### **Systems Thinking in Chemistry Education (STCS 2030+)**

A new project about STICE has been approved. It consists of three strands of which one will focus on supporting IUPAC's contribution to the International Year of Basic Sciences for Development (IYBSD) 2022.

#### **The Periodic Table Challenge**

The challenge has been moved to the IUPAC.org website. It is now available in several languages. It is now available in English (42830 participants), Chinese (3375 participants), Spanish (2119 participants) Arabic (1132 participants), Russian (39 participants). Within a short time Italian and French will also be available.

In total the challenge had players from 135 countries, 14 k players took part in 2020, 12k certificates were issued. When a participants scores 60% or more he/she is eligible for a certificate, which is generated as a pdf-file. Since there are still some periodic tables signed by Nobel laureates left, we have decided to award these to schools that have made a special effort to compete in the challenge.

Participants can choose three levels at which they can play the challenge, easy, intermediate and difficult.

The questions within the challenge (about 150 in each category) will need to be edited regularly.

### **OPCW**

Several attempts were made to contact the Advisory Board on Outreach and Education. So far that has not led to any concrete result. We have not received any answer from the board, apart from a request for review of video's, which was dealt with in early 2019. Through the president of IUPAC we received a request for possible participants in a new temporary advisory board focusing on on-line presentations. CCE is open for contact requests from OPCW.

#### 4. Tabular material

**Table 2. Link to IUPAC strategic Plan**

<b>IUPAC Strategic Plan</b>	<b>CCE activity</b>	<b>Completion in:</b>
IUPAC is an indispensable worldwide resource for chemistry	Cooperated in project the Periodic Table Challenge	2020
The International Union of Pure and Applied Chemistry is the global organization that provides objective scientific expertise and develops the essential tools for the application and communication of chemical knowledge for the benefit of humankind and the world.	Several attempts were made to contact the ABEO of OPCW, without success	2019  2020
Brand IUPAC in the minds of stakeholders	Support of ACRICE	2019
Improve quality and frequency of communication with stakeholders	First and second issue of CTI	2019
	Organization of ICCE	2021/2022/2024
Enhance interdivisional interaction and collaboration	Cooperation in projects	
Emphasize multidisciplinary projects addressing critical global issues	Project on systems thinking in chemistry education Second project: Systems thinking in chemistry for sustainability: Toward 2030 and beyond	2019/ 2020  2021 - 2024
Support chemistry education, particularly in developing countries	Support of ACRICE, ECRICE and NICE	ongoing

**Table 3. List of projects, in which CCE is participating, but has no leading role.**

	Project Numbers and lead. Org.	title	Start date
1	2020-020-2-600; Div VI	Enhancing capabilities for the mitigation of chemical risk: the dissemination of the Emergency Response Guidebook in Russian-speaking countries	14 Jan 2021
2	2020-011-2-041; ICGCSD	Assessment of the Contribution of IUPAC Projects to the Achievement of the United Nations Sustainable Development Goals	01 Oct 2020
3	2019-039-3-500; Division V	A review of current status of analytical chemistry education	01 Jan 2020
4	2018-030-2-200; Div VIII	Toward a comprehensive definition of valence	21 Jan 2019
5	2018-005-2-024; CPCDS	InChI Open Education Resource	01 July 2018
6	2017-040-1-700; Div VI	Chemistry in the Classroom	19 Dec 2017



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

### 19.2 CHEMRAWN Committee Report to Council

Prof. F. Kerton

#### Executive Summary:

The work of the CHEMRAWN committee brings chemistry into action in civil society in a way that benefits people and their quality of life. The topics that CHEMRAWN focuses on are all subjects that relate closely to the UN Sustainable Development Goals and as such the committee serves the vision of IUPAC as part of ‘an indispensable worldwide resource for chemistry’. All Committee activities are therefore aimed at fulfilling IUPAC’s mission and strategic plan through the committee’s goals in pursuit of the application of chemistry in the service of humankind and the world. We are currently diversifying our means of achieving these goals, not only in our established one-of-a-kind multidisciplinary conferences and the work of the future outcomes committee for our conferences, but with outreach, workshop and symposia to raise the profile of IUPAC with stakeholders. The committee has been impacted by the move to virtual meetings but continues to move forward and rebuild. For example, we have organized a symposium for the virtual IUPAC World Chemistry Congress 2021 “Building Bridges – Partnerships in Science to Address Health, Environmental Protection and Peace” and a social media workshop for the same meeting. We have made progress in building collaborations with other committees and divisions during the past year, and the CHEMRAWN XXII E-Waste Africa Conference in Lagos, Nigeria will take place later this year using a hybrid model. A CHEMRAWN special issue of Pure and Applied Chemistry was published in April 2021.

#### CHEMRAWN priorities include:

- Developing relationships to work collaboratively with committees/groups/divisions both inside and outside of IUPAC e.g. a project on equipment sharing networks with Division V and Division VI.
- Raising awareness, social responsibility, and understanding of how chemistry and related disciplines can be used to address unmet world needs in areas including sustainable development, health and equality.
- Successful coordination and completion of CHEMRAWN XXII E-Waste Africa Conference in Lagos, Nigeria and planning of future CHEMRAWN Conferences, webinars and symposia.
- Reinvigorating our committee through frequent virtual meetings, improved engagement/involvement of current committee members and recruitment of additional National Representatives.



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

The Committee continues collaborating with the Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD) and supporting the administration of the biennial process for the CHEMRAWN VII Prize on Environmental & Green Chemistry. The 2020 Prize was awarded to Dr. Banothile Makhubela (University of Johannesburg, South Africa) and Dr. Huizhen Liu (Institute of Chemistry of the Chinese Academy of Sciences, China). They will receive their awards at the postponed 9th IUPAC Conference on Green Chemistry that will be held in Greece. We have also been working with ICGCSD and other IUPAC divisions and committees in project 2020-011-2-041 “Assessment of the Contribution of IUPAC Projects to the Achievement of the United Nations Sustainable Development Goals.” Due to the burn-out and general exhaustion that many are experiencing while working from home during the pandemic, and the additional demands of remote teaching for many committee members, progress towards project submissions has been slower than anticipated.

### **Plans and priorities for this biennium, and beyond:**

Our planned activities are fundamentally aligned with the IUPAC’s objectives and include:

- Highlighting and addressing global needs that could benefit from matured concepts arising from applied chemistry research and associated chemical technologies.
- Promoting communication among chemists, organizations and stakeholders in civil society with special emphasis on bringing them together to achieve practical solutions for world needs, which from a global perspective are often issues for developing countries. As part of this conversation, other disciplines are involved in these discussions with a view to promoting a better understanding and to work toward realistic solutions.
- Leveraging IUPAC’s resources platform through improved interdivisional interaction and collaboration. This includes an equipment sharing network initiative with Division V and Division VI.
- Supporting multidisciplinary initiatives/projects that can evolve towards addressing critical global issues and the development of related conferences. Where appropriate, beyond conferences, we will carry on the conversation by making use of virtual technologies, social media platforms and other newer/emerging means to achieve these goals
- Repositioning the chemical sciences towards enhancing research for capacity building via the application of chemistry globally, especially in developing countries, towards solving their needs.
- Increasing the diversity and a broader member base for our committee and IUPAC as a whole.
- Promoting entrepreneurship and innovation via chemistry for socio-economic development.



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

Our committee has organized a symposium “Building bridges – partnerships in science to address health, environmental protection and peace” and a social media workshop at the IUPAC World Chemistry Congress 2021. Furthermore, Dr. Zafra Lerman (TM of our committee) will be a Plenary Speaker at the congress. On this note, our committee is eager to work with Lerman and organizers of the Malta conference series to raise the profile of IUPAC and CHEMRAWN with their attendees from Middle Eastern Countries. The committee aims to look into methods of support and alternative fundraising strategies. We will especially focus on raising funds to sponsor the next generation of scientists to attend such meetings. CHEMRAWN XXII Conference, E-Waste Africa, (IUPAC Project 2020-021-1) in Lagos, Nigeria will take place using a hybrid model to allow plenaries and attendance by chemists from around the world. Members of CHEMRAWN (Leiv Sydnes, AM, and Jay Oghifo, TM), the Local Organizing Committee and the International Advisory Board have been working hard during the past year. They have been working with IUPAC NAOs and regional chemical bodies in Africa, and collaborating with Division VI (Chemistry and the Environment) via Nadia Kandile (AM, CHEMRAWN, Egypt). There is interest from our colleagues in Asia about exploring the possibility to hold a similar conference at a later date because E-waste is considered a critical problem in South-East Asia too. One idea moving forward is for successful CHEMRAWN conferences to be replicated in different regions around the world. Another goal is to consider organizing an international conference on science entrepreneurship in collaboration with COCI. In keeping with the CHEMRAWN goals, this initiative is to be especially directed toward the needs of chemists in low-income countries. We have come to realize that there are inherent challenges in organizing our conferences (leveraging funding) in locations where they are most needed. This may require some imaginative and non-traditional fundraising activities as we move forward such as crowdfunding.

Planning for a health-related CHEMRAWN conference has been hindered due to time needed by members to address the current pandemic and urgent matters surrounding it. However, this is something that members of the committee remain interested in pursuing. We will be reaching out to Division VII (Chemistry & Health) and COCI as we progress in the organization of conferences in this area. Another timely topic for a future CHEMRAWN conference that we are at the very early stages of considering is ‘Plastics and the Environment’, we encourage other IUPAC committees and divisions to contact us if they are interested in being involved. At this stage, we are planning to organize a CHEMRAWN-themed symposium at the World Chemistry Congress in Malaysia 2025 on the topic of plastic pollution or a related area.

We are also working to continue to capitalize and leverage the IUPAC CHEMRAWN Ambassador’s initiative to encourage our members to look for occasions to offer presentations in international, national and regional conferences on relevant themes. However, this has not been possible in 2020-21 due to the covid pandemic.



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

We have met virtually six times since December 2019, and we intend to continue this intensive spell of virtual meetings to reinvigorate our committee. We are also making use of google docs to share and develop ideas across our committee. Dr Joon Ching Juan (CHEMRAWN, AM) has been trained to edit the CHEMRAWN website and it was updated during 2021.

### ***An overall report of Division/Committee activities and achievements during the 2018-2019 biennium organized by the Goals and Objectives laid out in the current IUPAC Strategic Plan.***

Due to precarious position of the CHEMRAWN committee (facing dissolution at the Paris General Assembly, 2019), it was challenging to achieve significant progress and engagement towards our committee's and IUPAC's goals. The main priorities targeted for the 2018-2019 biennium aimed to address functional, operational aspects of the committee, programmatic initiatives and project workload, and communication with the executive committee of IUPAC. Due to these circumstances, activities from projects and initiatives programmed during the past biennium (2018-19) were slowed down or put on hold. We have developed a work plan that is less dependent on conferences and have been developing alternate activities through which similar objectives can be attained in between conferences. CHEMRAWN XXII will take place later this year (2021). We have been active with planning symposia/workshops for the 2021 IUPAC World Chemistry Congress, and in reaching out to other Divisions/Committees to become involved with their projects and to develop our own ones too.

We have been and will be addressing IUPAC's Goals in a number of ways and especially:

- (i) Provide scientific expertise to address critical world needs. Our committee, as its name states, targets the use of chemical research to meet unmet world needs. For example, we continuing to organize, with the local organizing committee, the CHEMRAWN XXII conference "E-waste Africa", which will be held in Lagos, Nigeria in 2021 using a hybrid model to allow global involvement.
- (ii) Improve the vitality, effectiveness and efficiency of our Union. We are working with chemists in emerging economic regions that are typically under-represented in the Union. Engaging with chemists truly representing the whole world in which we live will improve the vitality of the Union. Furthermore, we are investigating newer avenues of communication and outreach (e.g. webinars, social media) to increase efficiency within our committee and our interactions with others.

We have been addressing IUPAC's Objectives in a number of ways:

"Brand IUPAC in the minds of stakeholders" – through our IUPAC CHEMRAWN ambassadors' program we have given seminars on what IUPAC is and highlighted the work of the CHEMRAWN committee over the years, and sponsored symposia and workshops. This included a Green Catalysis one-day CHEMRAWN committee mini-symposium at the 2019 18th



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Asian Chemical Congress (Taipai, Taiwan, 2019), and XI International conference “The mechanisms of catalytic reactions” (Sochi, Russia, 2019).

“Improve quality and frequency of communication with stakeholders” – since the Sao Paolo General Assembly, we have established social media accounts (e.g. twitter and Facebook) and are continuing to work on such platforms and increase training opportunities for other chemists under the IUPAC CHEMRAWN banner. For example, Dr. Raychelle Burks and Dr. Fran Kerton (current chair) are organizing a social media workshop at the 2021 IUPAC World Chemistry Congress.

“Expand and retain Member and volunteer base with an emphasis on diversity and inclusion” – through our CHEMRAWN ambassador’s program mentioned above, talks on IUPAC have been given at events for the Global Women’s Breakfast in 2019, and around the world (including Caribbean Countries and Egypt).

“Enhance interdivisional interaction and collaboration” – We participated in IYCN events such as the ‘speed-dating’ event at the Paris 2019 World Chemistry Congress. This included the preparation of a booklet and poster highlighting previous and planned works of the CHEMRAWN committee. This was also an opportunity to meet with and talk with members of other IUPAC divisions and committees. We would like to develop projects with other committees and divisions during the forthcoming biennium and have already been working with Division VI for the CHEMRAWN XXII conference E-Waste Africa. Two CHEMRAWN committee members are part of the task group for the project ‘Creation of IUPAC Global Women’s Breakfast Series and a Global Network in Support of Eliminating the Gender Gap in the Chemical Sciences’ so will be working with a team of other IUPAC volunteers representing a range of disciplines. We have had conversations and been involved with meetings and/or projects led by COCI, CCE (project 2020-019-4-050), ICGCSD (project 2020-011-2-041), Division V and Division VI.

“Emphasize multidisciplinary projects addressing critical global issues” – As outlined above, a key outcome of the past biennium has been the organization of CHEMRAWN XXII Conference on E-Waste. Division VI has been involved in this initiative. We are starting to develop projects with other committees and divisions during the current biennium (e.g. equipment sharing network with Division V and Division VI). These plans have been delayed due to covid.

“Support chemistry education, particularly in developing countries” – An important aspect of our forthcoming CHEMRAWN XXII E-waste Africa conference will be the development of teaching materials and specifically to communicate with the public regarding remediation of E-waste and pollution that can occur if electronic materials are not disposed of appropriately. We continue to work with chemists in Nepal on Capacity Building for Chemistry Research and we will be communicating with Chemistry Education to collaborate on future initiatives. We are currently working with CCE on a special issue of Chemistry Teacher International based on



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project 2020-019-4-050 (Examples of the introduction of sustainable development as well as green industrial processes for Secondary School Chemistry and Introductory Chemistry).

### **Tabular Material**

#### ***Conferences, symposia and outreach activities for 2019 onwards:***

- As part of GWB activities in the IUPAC centenary year, February 2019, Kerton gave the short promotional talk “How to Guide: Women in IUPAC and Opportunities for You” in Atlantic Canada (she connected virtually with four Universities across the region).
- “Introduction to the International Union of Pure and Applied Chemistry”, a keynote lecture by Prof. Nadia Kandile (AM) was given at the conference of the Egyptian Committee of Pure and Applied Chemistry 20-22 Oct 2019, Hurghada, Egypt
- “Introduction to the International Union of Pure and Applied Chemistry”, departmental seminar, and “Introduction to Green Chemistry and Opportunities for International Collaborations”, workshop, were given by Francesca Kerton (Chair, CHEMRAWN) at the University of West Indies-St. Augustine, Nov 2019
- Green Catalysis one-day CHEMRAWN committee mini-symposium at the 2019 18th Asian Chemical Congress, Taipei, Dec 12, 2019 [organized by Prof. Brindaban Ranu (AM) with industrial support leveraged by Hidehiko Yashima (TM)]. This involved opening remarks where the function and objectives of the CHEMRAWN committee under the umbrella of IUPAC were explained to the audience. Outcomes included suggestions for future impactful research including bio- and photo-catalysis, ball-milling (solvent free) processes and economically viable, recyclable catalyst systems for industrial applications.
- An oral presentation of IUPAC/CHEMRAWN activities was given by Prof. E.Lokteva at the XI International conference “The Mechanisms of Catalytic Reactions” (Sochi, Russia, 2019).
- IUPAC CHEMRAWN Ambassador initiatives at conferences during 2020 were not possible due to the impacts of the pandemic.

#### ***Publications***

- Gary W. van Loon and Atanu Sarkar, Feeding the World in a Time of Climate Change, Chemistry International 2021, 43(1), p.14
- CHEMRAWN Special Issue of Pure and Applied Chemistry, volume 93, issue 4, 2021

#### ***Projects led by CHEMRAWN:***

2020-021-1 “CHEMRAWN XXII E-waste in Africa Conference”

#### ***Projects led by other Committees/Divisions involving CHEMRAWN members:***

2020-011-2-041 “Assessment of the Contribution of IUPAC Projects to the Achievement of the United Nations Sustainable Development Goals”

2020-019-4-050 “Examples of the introduction of sustainable development as well as green industrial processes for Secondary School Chemistry and Introductory Chemistry”

## **Report to Bureau April 2021**

### **I. Highlights and/or Executive Summary**

#### **Goal 1: Provide scientific expertise to address critical world needs**

- COCI involves representatives from other committees and divisions in its activities and projects. Also, COCI members take an active part in the activities and projects of other standing committees and divisions.
- COCI has been leading the engagement of IUPAC with the Strategic Approach to International Chemical Management (SAICM) which promotes safety using of chemicals. Anna Makarova (COCI Chair) and Saha Bipulbehary (COCI secretary) took part in virtual working groups. The SAICM discussion process is currently underway in virtual groups. Due to the Covid-19 situation, the Fifth session of the International Conference on Chemicals Management (ICCM5) has now been postponed.
- The Safety Training Program continues to provide environmental, health, safety, and security training to scientists from developing countries. Since 2000, the STP has trained 20 STP Fellows and 9 STP Associate Fellows from 18 countries.
- The most significant challenge is identifying and getting Host Company commitment to train these applicants, particularly with Chemical Industries challenges due to the COVID-19 pandemic.
- Another major challenge is solidifying sustainable, ongoing funding from IUPAC & Industry for STP.
- Given the problems with face-to-face meetings and funding, we focused on a) e-learning b) additional funding from other organizations. As a result, in 2021 COCI started a project with the financial support of the OPCW 2021-003-1-022 'SAFETY TRAINING PROGRAM E-LEARNING'.

#### **Goal 2: Increase the Value of our product and services**

- COCI continues to administer the ThalesNano Prize for Flow Chemistry in partnership with the Flow Chemistry Society. Timothy Noel is awarded the 2020 IUPAC-ThalesNano Prize for Flow Chemistry. But due to pandemic the COCI, the time and place (meeting) where the awards ceremony will be held has not yet been determined.

#### **Goal 3: Improve the vitality, effectiveness and efficiency of our union.**

- COCI will engage with IYCN Network both in the COCI and SAICM areas.
- COCI is building cooperation with industry. COCI have built strong relationship with Indian Chemical Council (ICC) and Chemical Industries Association of Uruguay (ASIQR)
- COCI also organized a webinar for the members of "Association of Chemistry Teachers, India"
- COCI, via our SAICM project, will provided financial support for an IYCN member to attend the SAICM meeting.
- *Objective 5: Enhance interdivisional interaction and collaboration*
- COCI will continue to cooperate with the ICGCSD, CCE, CHEMRAWN, IYCN and Divisions V and VI on areas of mutual interest.
- COCI, within SAICM, is conducting a multidisciplinary project which aims to address such global challenges as the safe handling of chemicals and green chemistry.
- COCI experts participate in the several multidisciplinary projects: Assessment of the Contribution of IUPAC Projects to the Achievement of the UN SDGs (together with ICGCSD); Systems Thinking in Chemistry for Sustainability: Toward 2030 and Beyond (together with CEE); Examples of the introduction of sustainable development as well as green industrial processes for Secondary School Chemistry and Introductory Chemistry (together with CEE).
- The COCI and STP web site pages additional major revisions and updates.

## II. COCI Plans and priorities for 2020-2021

### Goal 1: Provide scientific expertise to address critical world needs

- The COCI-SAICM project includes experts ICGCSD and Division VI. COCI have projects with ICGCSD and CEE. COCI will also collaborate with Division V's planned efforts relating to industry.
- The COCI-SAICM project provides the public and stakeholders an opportunity for understanding IUPACs activities in promoting safe use of chemicals as its project's main goal and to assess future common activities.
- **Safety Training Program (STP).** The increasing need for the involvement by the Chemical & Pharmaceutical Industry (a perennial problem) as well as solidifying sustainable, ongoing funding from IUPAC, IUPAC Project Committee & Industry. The third STP Latin America (STP3) project is planned at the Republica Universidad in Uruguay organized by Fabian Benzo. A new STP Regional Project is being explored for the Africa region. A STP Workshop is planned for IUPAC General Assembly in Montreal, 2021.
- **E-learning.** In the last years, it was very difficult get companies willing to host and get partners to financial support for STP Fellowship Program. Considering the current COVID-19 pandemic, this situation does not seem likely to improve. In this context, the STP e-learning arises, as alternative of the face-to-face modalities, but with the same spirit and objectives of original STP. The objective of STP e-learning is revitalize the STP as a whole, brooding the scope regarding the number and countries of origin of the trainees.

### Goal 2: Increase the Value of our product and services

- The 2020 IUPAC-ThalesNano prize for Flow Chemistry has been awarded to Professor Timothy Noël of the University of Amsterdam's Van 't Hoff Institute for Molecular Sciences.

### Goal 3: Improve the vitality, effectiveness and efficiency of our union

- COCI will engage with IYCN Network to explore how the IYCN members can contribute to COCI.
- COCI work together with UN Environment in the 'Youth Engagement Strategy'
- COCI work together with UN Environment on the guidelines in the field Green and Sustainable chemistry
- COCI is building cooperation with different organizations. COCI have built strong relationship with Indian Chemical Council (ICC). In the first meeting ICC-IUPAC Mary, Anna Makarova (Chair, COCI), Jean Pelin (TM, COCI) and Saha Bipulbehary, (COCI Secretary) had detailed discussion with ICC and identified areas of cooperation. Subsequently, ICC requested us to organize a webinar on "Sustainable Chemistry" by IUPAC affiliated scientist. After discussion with ICGCSD, COCI organized a webinar in which Prof. Klauss Kuemmerer (TM, ICGCSD) delivered a speech on the topic "From Green Chemistry to Chemistry in a Circular Economy to Sustainable Chemistry". It was attended by 120 senior executives of ICC.
- COCI also organized a webinar for the members of "Association of Chemistry Teachers, India"
- Global Women Brechaft 2021: COCI expert (Saha Bipulbehary) was involved in organization of very successful GWB2021 program in India. Out of 324 global events, 61 events were held in India. He is enclosing flyer of few events. There was very enthusiastic participation. In one webinar, he made a presentation on "Best Practices of Promoting Women Scientists in Indian Organizations". It was attended by more than 1500 participants.
- COCI, via our SAICM project, will provided financial support for an IYCN member to attend the SAICM meeting.
- COCI is planning to participate, where appropriate, in the UN Environment and ISC3 planning activities on involving youth from all over the world in the process of safe handling of chemicals.
- COCI will continue to cooperate with the ICGCSD, CCE, CHEMRAWN, IYCN and Division V on areas of mutual interest. This includes:
  - the ICGCSD project 'Assessment of the Contribution of IUPAC Projects to the Achievement of the UN SDGs'
  - the CEE project 'Systems Thinking in Chemistry for Sustainability: Toward 2030 and Beyond'
  - the CEE project 'Examples of the introduction of sustainable development as well as green industrial processes for Secondary School Chemistry and Introductory Chemistry'
- COCI, within SAICM, is conducting a multidisciplinary project which aims to address such global challenges as the safe handling of chemicals and green chemistry.
- COCI expert (Saha Bipulbehary) continue to directly participate in the multidisciplinary project on SDGs.
- COCI and STP websites underwent major revisions and updates in February 2020 including standardizing the STP Fellows, STP Associate Fellows and STP Workshops pages. All available historical files are now on these pages

### III. Expanded Description of COCI Activities and Achievements from 2018-2019 Biennium

#### *Objective 1: Brand IUPAC in the minds of stakeholders*

##### IUPAC 100 and IYPT

- COCI STP actively engaged with IUPAC-100 Celebration Project. Bernard West and Robert Audette compiled and wrote about the current Safety Training Program and the profiles of 6 STP Fellows - “*IUPAC Contributes to Global Chemical Safety by Training Leaders in Developing Countries*” which was published in August 2019 on the 2019 IUPAC 100 Celebration Stories website (<https://iupac.org/100/stories/safety-training-program/>).
- Saha Bipulbehary (COCI Secretary) shared presentations on IYPT and IUPAC 100 at the COCI 2019 AGM. Everyone was invited to the opening ceremony at UNESCO in Paris.
- The Periodic Table of Younger Chemists is going well. COCI would like to see more industrial chemists recognized.
- Saha Bipulbehary (COCI Secretary) was actively engaged during 2019 in numerous presents concerning the IYPT and IUPAC100 in India and Asia. He was invited to make a presentation at the Closing Ceremony of IYPT in Tokyo, Japan.

#### *Objective 2: Improve quality and frequency of communication with stakeholders*

- A COCI representative was part of the delegation of IUPAC scientists attending the Fourth Review Conference of the Chemical Weapons Convention (held in November 2018 in The Hague). The delegates from IUPAC Divisions and Committees had the opportunity to provide an outline of their areas of activity and expertise at a side-event of the Review Conference. The side-event was very well attended by diplomats from across many of the 193 States Parties (including Ambassadors Member Nations of the OPCW to the Netherlands) and OPCW staff (it was a standing room only event).
- The COCI representative, together with the representative of ICGCSD, participated in a meeting organized by the UN Environment to discuss a draft UN document - a guide to green chemistry.

#### *Objective 4: Expand & retain member & volunteer base with an emphasis on diversity & inclusion*

- COCI coordinated the presentation of the 2018 Thales Nano Prize in Flow Chemistry to Oliver Kappe, University of Graz, Austria at IMRET 2018, Karlsruhe, Germany. Dr. Kappe has been an unequaled Ambassador for Flow Chemistry since its inception.
- COCI-STP sponsored STP Fellow (2007) Fabio Benzo (Uruguay) as a Plenary Speaker for the Ibero American Chemistry Congress Lima (Peru) in October 2018. Prof. Benzo highlighted the IUPAC program, its primary activities, publications and projects as well as the IUPAC100 celebrations. He gave a second presentation that highlighted the COCI-STP program and provided an overview of the STP-Latin America (STP-LA) and its financial and educational impact on Central & Latin America industries and government and educational institutes.
- Awards for Distinguished Women in Chemistry and Chemical Engineering was presented to twelve scientists at the World Chemistry Congress in Paris, July 2019. This is the fifth class of award recipients.
- COCI STP actively engaged with IUPAC-100 Celebration Project. Bernard West and Robert Audette compiled the current profiles of 6 STP Fellows and their contributions to safety and security in their home countries (Egypt, India, Kenya, Nigeria, Turkey and Uruguay) and regions (Southern Europe, Northern and Central Africa, Central & Latin America). The current Safety Training Program and the profiles of 6 STP Fellows - “*IUPAC Contributes to Global Chemical Safety by Training Leaders in Developing Countries*” was published in August 2019 on the 2019 IUPAC 100 Celebration Stories website (<https://iupac.org/100/stories/safety-training-program/>). (thanks to Fabienne Myers for designing and publishing the material on this site.)
- Saha Bipulbehary (COCI Secretary) was actively engaged during 2019 in numerous presents concerning the IYPT and IUPAC100 in India and Asia.
- Anna Makarova (COCI Chair) was actively engaged in the COCI-SAICM cooperation. She participated in the third meeting of the intersessional process considering the Strategic Approach and sound management of chemicals and waste beyond 2020, Bangkok, Thailand, October 2019.
- COCI engaged with the IYPT to explore ways for expanding the engagement of young chemists in COCI activities.
- The committee appreciates the very significant financial and in-kind support from Bayer, AG Germany, CRDF and ThalesNano during the biennium.
- In 2019, COCI (Saha Bipulbehary, COCI Secretary) organized large number of programs in various cities of India to celebrate “IUPAC Centenary” and “International Year of Periodic Table – IYPT2019” which were attended by students, academicians and industry professionals. These programs were highly appreciated and COCI (Saha Bipulbehary, COCI Secretary) was invited to make presentation on “Selected IYPT activities in India” in the closing ceremony of IYPT2019 in Tokyo. Some of the program organized by COCI (Saha Bipulbehary, COCI Secretary):
  - IUPAC100 and IYPT kick off meeting in Hyderabad on August 02, 2018.

- IYPT and IUPAC100 first program in India on January 02, 2019, Hyderabad.
- IUPAC100 and IYPT program in Delhi on January 09, 2019.
- IUPAC100 and IYPT program in Mumbai on January 10, 2019.
- IYPT program and quiz with school children on February 01, 2019 at IICT, Hyderabad.
- IUPAC100 and IYPT program in Shadnagar on March 20, 2019.
- Celebration of IYPT 2019, Reeds World School, Coimbatore, Aug 13 & 14, 2019.
- Science Fair on Periodic Table, RSC (India) and CSIR-IICT, August 17, 2019.
- Science Exhibition on Periodic Table, NGP School, Coimbatore, August 31, 2019.

*Objective 5: Enhance interdivisional interaction and collaboration*

Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD)

- the activities of ICGCSD are successfully developing in the two areas of Education and Cooperation. Green chemistry summer schools in Tanzania and Venice were being held and conferences on green chemistry are being organized. Organizations such as the OECD and OPCW are actively involved in the committee.

Cooperation with Division V

- Jab Labuda, Division V (Analytical Chemistry), informed COCI on an objective to establish a sub-committee of Division V for analytical chemical related industries (e.g. laboratories, instrument manufacturers and component providers).

*Objective 6: Emphasize multidisciplinary projects addressing critical global issues.*

Strategic Approach to International Chemical Management (SAICM):

- The collaboration between different types of stakeholders in the framework of SAICM is very important. If IUPAC want to be one of the leaders in the academia sector in SAICM, it is necessary for IUPAC to take part in discussion between the stakeholders about the future development of chemistry and chemical industry. Key stakeholders for this activity are UN Environment, CEFIC, ICCA, WHO etc.
- Since the modern chemistry includes intellectual achievements, scientific creativity and originality and the acquisition of new knowledge, the IUPAC has a unique opportunity to contribute to the interdisciplinary chemical goals in frame of SAICM. For example, IUPAC's vision of green chemistry, might use as basic standards of chemicals safety in the academic, industry and other fields.
- Anna Makarova (COCI, Chair) outlined at the COCI 2019 AGM the framework of the project working group's meeting "*Building Broader and Deeper Links Between Strategic Approach to International Chemicals Management (SAICM) and IUPAC*". For this realization the next steps are planned in frame this project:
  - Step 1: Analysis of last documents on the implementation of SAICM beyond and after 2020. For this might be organize a visit on the third meeting of the Open-Ended Working Group for the SAICM is scheduled to take place on 2-4 April 2019 in Montevideo, Uruguay (or correspondence study of documents for this meeting).
  - Step 2. Update information on the IUPAC contribution to the implementation of SAICM and prepare a position and papers to present the capabilities and activities of IUPAC at ICCM5. The discussion these papers and the IUPAC 50th General Assembly (COCI meeting etc.) in Paris in July 2019.
  - Step 3. A presentation on the activities of IUPAC will be prepared at ICCM5. This information will be as a basis for discussing joint SAICM activities with UN Environment, CEFIC, and ICCA.
  - Step 4: Prepare the IUPAC Recommendation for further activities in the framework of SAICM. The result of the project will be the recommendations of IUPAC regarding possible development activities within the framework of SAICM.
- Within the framework of the project "*Building Broader and Deeper Links Between Strategic Approach to International Chemicals Management (SAICM) and IUPAC*" IUPAC COCI have at the following events:
  - Second meeting of the Intersessional Process for considering SAICM and the sound management of chemicals and waste beyond 2020 - Stockholm, Sweden 13-15 March 2018.
  - Third meeting of the intersessional process considering the Strategic Approach and sound management of chemicals and waste beyond 2020, Bangkok, Thailand, 1-4 October 2019)
- International Conference on Chemicals Management (ICCM5), Bonn, Germany, 5-9 October 2020. COCI, at their 2019 AGM, decided to approve and support the implementation of this project. In August 2019 the COCI-SAICM Project was finalized and approved (2019-011-1-022 Makarova).
- Anna presented a report on the results of the presentation of COCI activities at a general meeting in the framework of cooperation between IUPAC and the OPCW. The OPCW is particularly interested in cooperation in the field of education and communications with industry.

*Objective 7: Support chemistry education, particularly in developing countries.*

**Safety Training Program (STP)** continues to provide environmental, health, safety, and security training to scientists from

developing countries. Since 2000, STP has trained 20 STP Fellows and 9 STP Associate Fellows from 18 countries who continue to drive improvements in environmental, health, and safety practices at their institutions, home country and regions. Several have expanded their outreach to community groups, industrial organizations, and even television and radio interviews. The STP program has impacted over 20,000 people in the past 2 decades:

- The 2019 STP Latin America (STP-LA2) regional training program was very successful. Five students were trained for 2 weeks in November 2018 at the Republica Universidad in Uruguay in the program designed and organized by Fabian Benzo (STP Fellow 2007). Based on the feedback from the participants, results were excellent. The objectives were achieved. The organizers are interested in continuing the program. They had 40 applicants from 10 countries, demonstrating the good communication they had and the interest in the safety and security material. The participants were from academia (Panama and Honduras) industry (Bolivia), and government (Brazil and El Salvador). Training materials were leveraged from the original 2017 STP-LA workshop. The program was funded by IUPAC, COCI and UNITAR.

The nine STP-LA and STP-LA2 trainees from Argentina, Bolivia, Brazil, Columbia, Costa Rica, El Salvador, Honduras, Panama and Venezuela were designated *STP Associate Fellows* in the fall of 2018.

- The second STP Regional Project, STP-India, was conducted by Dr. G. Grover (STP Fellow 2008) in 2019. Its objective was to reach out to Indian institutions and provide a 90-minute safety awareness (orientation) in-service seminar and discussions. The focus was on researchers, teachers & science students at High Schools, Universities, Colleges and doctoral students in R&D organizations in India. These presentations were given over 12 months to approximately 1000 persons at Modern & MES Garware Colleges (Pune), Sanjay Ghodavat University (Kolhapur), IISER (Kolkata), IIT Mandi and Women's College in Cochin. One of the conclusions was "in a society that is generally unaware, unwilling and unable to follow safe practices either for want of resources or an inherent carefree attitude." Dr. Grover's detailed STP-India Project final report was submitted in Sept 2019, was approved by COCI in October 2019. This project has now been completed.
- STP Fellowship trainee candidate, Austin Aluoch from Kenya (Chair of the Kenyan Chemical Society) was trained for four weeks at Bayer AG, Germany in June-July 2019 (***This was unusually long as the normal STP training is 1-2 weeks***). His international travel was sponsored by CRDF and STP provided additional support for some local meals while he was training. He provided his final STP training report in January 2020. It was reviewed and after revisions accepted by COCI and Austin was designated an *STP Fellow* in January 2020.
- Robert Audette (TM, Canada), the STP Coordinator, extensively reviewed, revised and updated the STP program in 2018-2019. The highlights of this review include:
  - A detailed STP Program Review with general items such as the new STP e-mail account ([STP@IUPAC.ORG](mailto:STP@IUPAC.ORG)), updated STP Fellowship Application form and STP Requirements for STP Fellowship Trainee Reports; the STP's work on the IUPAC 100 Celebration Project, STP Fellows profiles, articles and brochure; the electronic organization, tracking and updating of STP files [ including: 1) STP Administration tracking lists, STP Historical files from 1993-2019 and STP Brochures; 2) Revising & developing STP world maps (2005-2019) showing STP Fellows trained & Host Companies to be added to STP website; 3) STP files on Fellows, Associate Fellows, STP Programs and Workshops (2000-2019) to be added to the STP Workshops web page.]; STP Fellowship program underwent a detailed review and rationalizing of the STP Fellowship approved applicants awaiting Host Company training [down to 4 (2013-2017) from 17 (2005-2017)] and the STP Regional Projects overview - STP-Latin America and STP-India. The nine STP-LA and STP-LA2 trainees were designated STP Associate Fellows in the fall of 2018.
  - The STP Current Status including its website underwent major revisions and updates in Aug-Sept 2019.
  - The STP Future Directions and Future Challenges highlights that there were 4 approved STP Fellowship candidates awaiting training, a potential Host Company and the planned STP Regional Projects (STP-Africa). Future challenges include broadening the program, but the continuing major challenge was the increasing need for the involvement by the Chemical & Pharmaceutical Industry (a perennial problem) and solidifying sustainable, ongoing funding from IUPAC, IUPAC Project Committee & Industry.
  - Kazuhiko Ishikiriya (TM, Japan), after the COCI 2019 AGM, took the lead on exploring the potential of a Host Company in Japan to train our 4 STP Fellowship approved applicants awaiting Host Company training. He explored this with Mitsui Chemicals Japan however in early January 2020 they indicated they were not able to assist us at this time.
- The 2019 STP Workshop occurred on Monday, July 8 at the IUAPC General Assembly in Paris. The theme of the 2019 STP Workshop was "*Celebrating 20 Years of IUPAC COCI Safety Training*" highlighting STP accomplishments over the past 20 years. The agenda included: Two Keynote Speakers (Mark Cesa and Bernard West) providing a history from 1993-2017; presentation by the Host Company (Bayer AG, Germany) as well as the current STP Fellowship trainee (Austin Aluoch); two STP Fellows presentations [Fabian Benzo with an overview of the STP-Latin America (STP-LA)

program and Christine Ashaolu presenting her current work in Nigeria]; two STP Associate Fellows presenting their experiences with the STP-LA program and ended with the STP Coordinator's overview of the current STP Status and the Future. This included an overview of the STP Fellowship program, the STP Regional Projects (STP-LA and STP-India update), the STP Current Status and STP Future Directions and Challenges. The later includes increasing involvement and difficulties in recruiting Chemical & Pharmaceutical Industry companies as Host Companies and the MAJOR challenge of *solidifying sustainable, ongoing funding* from IUPAC, IUPAC Project Committee and Industry for the STP travel funding of STP Fellowship candidate training; STP Regional Projects and STP Workshops.

- The STP Coordinator reinstituted Mark Cesa's practice of presenting STP certificates. Using Mark's 1999-2002 template, he designed multiple STP certificates for a variety of purposes including certificates for the STP Workshop presenters. During the 2019 COCI AGM Robert Audette presented certificates to the two previous STP Coordinators (Mark Cesa and Bernard West) in recognition of all their dedicated work for STP; Fabian Benzo for his work on the STP-Latin America program; Host Company Bayer AG, Germany (received by Laura McConnell) and Austin Aluoch for completing his STP Fellowship training; all 2016 & 2018 STP Associate Fellows in recognition of the completion of their STP-LA training (given to Fabian Benzo for distribution). Two of 2018 trainees attended the meeting (Gracia Romero, Natiela de Oliveira) received their 2018 STP Associate Fellows certificates. During the STP Workshop Robert also reinstituted the practice of presenting STP certificates to all the speakers as a show of our appreciation for their STP contributions.
- The STP website underwent major revisions and updates in Aug-Sept 2019, including updating the STP Fellows page, the STP Workshops page and implementing a new STP Associate Fellows page. In October the STP webpages were moved under the main COCI webpage (thanks to the efforts of Lynn Soby).

#### IV. Tabular material:

##### List of Publications:

1. "Integrating Sustainability into Learning in Chemistry", Jane E. Wissinger", Aurelia Visa, Bipul B. Saha, Stephen A. Matlin, Peter G. Mahaffy, Klaus Kümmerer, and Sarah Cornell, J. Chem. Educ. 2021, 98, 4, 1061-63.
2. Talk by Prof. Klaus Kümmerer on "From Green Chemistry to Chemistry in a Circular Economy to Sustainable Chemistry". Chemical News, 17, February 2021.
3. "IUPAC Contributes to Global Chemical Safety by Training Leaders in Developing Countries", Bernard West & Robert Audette, August 2019, 2019 IUPAC 100 Celebration Stories website (<https://iupac.org/100/stories/safety-training-program/>) highlights the current Safety Training Program and the profiles of 6 STP Fellows contributing to safety and security in their home countries and regions.
4. "An easy, efficient PTC-Mediated synthesis of 2- substituted-6-chloroquinoxalines and antibacterial activity", T. Siva Sankara Babu, B. Saha and others, Rasayan J. Chem., 2020, 13(2), 1037-1041
5. "A Brief History of COCI Safety Training Program - A Global Project 1993-2019", Audette, Aug 2019 (STP website: [https://iupac.org/who-we-are/committees/committee-details/?body\\_code=022-1](https://iupac.org/who-we-are/committees/committee-details/?body_code=022-1))
6. "STP Brochure", West & Audette, August 2019 (STP website: [https://iupac.org/who-we-are/committees/committee-details/?body\\_code=022-1](https://iupac.org/who-we-are/committees/committee-details/?body_code=022-1))
7. "IUPAC Contributes to Global Chemical Safety by Training Leaders in Developing Countries", Bernard West & Robert Audette, Feb 2019 (STP website: [https://iupac.org/who-we-are/committees/committee-details/?body\\_code=022-1](https://iupac.org/who-we-are/committees/committee-details/?body_code=022-1))
8. "150<sup>th</sup> Anniversary of Periodic Table and Mendeleev", Bipul B. Saha and NJC Reddy, Chemical News, 2019 pp26-29.
9. M. Hojamberdiev, A. Makarova, and P. Tundo. Preliminary assessment of the contribution of IUPAC projects (2000-2019) to the achievement of the United Nations Sustainable Development goals. In *Abstract of the 50th IUPAC General Assembly & 47th IUPAC World Chemistry Congress, 7-12 JULY Paris (France)*, PS2 - CT.7 - Poster session 2 - Red Session -Chemistry across the themes: CT.7, pages 2522–2523. HOPSCOTCH Congress, 2019. <https://www.iupac2019.org/detailed-agenda>
10. Jan Apotheker, Anna Makarova, Aurelia Visa. Flying Chemistry Educator Program in Ulang Bataar, Mongolia. Chemistry International 42 (1), pp 37 – 41, 2020. <https://www.degruyter.com/view/journals/ci/42/1/article-p1.xml?rskey=MuNuMk&result=1>
11. B. Saha, Report on the Closing Ceremony of the International Year of the Periodic Table, Chemical News, January 2020, pp 70-72.

##### List of Conferences:

- (a) Best Practices of Promoting Women Scientists, National Conference on "Women led Science, Technology and Innovation", Hyderabad, India, 2019, Invited Speaker.

- (b) K. Vishakarma and B. Saha, Dissipation and residue analysis of Imidacloprid in Okra crop (Ladies' finger) under field conditions in different agro-climatic zones of India., May 2019, IUPAC International Congress of Pesticide Chemistry, Ghent, Belgium
- (c) B. Saha, "Selection of IYPT Celebrations in India", "Closing Ceremony of the International Year of the Periodic Table", Tokyo, December, 2019.
- (d) B. Saha, "Status of Biocontrol and Bistimulant Products in India", May 2019, IUPAC International Congress of Pesticide Chemistry, Ghent, Belgium

**List of COCI Current Projects (2020-2021)**

2014-020-1-022 Books\_West  
2017-009-1-022 Benzo  
2017-020-1-022 Benzo  
2019-007-1-022 Benzo  
2019-011-1-022 Makarova  
2020-009-1-022 Makarova  
2020-015-1-022 Benzo  
2020-002-1-022 ThalesNano  
2021-003-1-022 Benzo

**Projects in which COCI is involved (2020-2021)**

2020-014-3-050 Mahaffy  
2020-019-4-050 Apotheker

Anna Makarova, Chair, 2020-2023  
Saha Bipulbehary, Secretary, 2020-2023



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19.4 Committee on Publications and Cheminformatics Data Standards Report to Council  
Ms. Leah McEwen

### I. Highlights and/or Executive Summary:

The IUPAC Committee on Publications and Cheminformatics Data Standards (CPCDS) advises on issues related to dissemination of information, primarily of IUPAC outputs. The portfolio is expanding and diversifying, in types of content, modes of publication and potential readership. Publication of IUPAC recommendations, technical reports and other information resources remains at the core of IUPAC dissemination activity and that of CPCDS. Increasingly the committee also focuses on the development and dissemination of chemical data and information standards to facilitate robust communication in the digital environment ([“Towards Digital IUPAC”](#)).

CPCDS engages in a number of collaborative symposia and workshops with strategic partners including InChI Trust, CODATA, the GO FAIR Chemistry Implementation Network, the Research Data Alliance and other Scientific Societies to surface use cases and infrastructure needs for digital science among diverse community stakeholders. These activities lay the groundwork for developing a robust and systematic program for Digital IUPAC and “the creation of a consistent and interoperable global framework for human and machine-readable chemical information,” as articulated in the CPCDS Terms of Reference. This vision will be a critical component of success for IUPAC’s contribution towards the United Nations Sustainable Development Goals. Some activities of note include the [CODATA Task Group on the Digital Representation of Units of Measure](#), the [CAS Common Chemistry](#) project, the [Data Sharing for Scientific Societies Seminar Series](#), review of publication patterns in Chemistry as an extension to the [ISC Gender Gap project](#), and collaborating with the Polymer Division to embed [chemistry concepts into Wikipedia](#).

Critical among community needs are standard IUPAC definitions that can be parsed accurately and consistently for use in the many computer applications that support chemical data collection and analysis. There are very few *digital* standards for chemical information that enable unambiguous, consistent and interoperable expression and even fewer venues/approaches to develop such standards that facilitate broad input and consensus across sectors and jurisdictions in the manner in which other IUPAC standards are developed for use globally. Digital standards represent much more than online dissemination of IUPAC information, standard specifications and conventions to ensure that the encoding, expression and exporting of chemical information between computer systems support a common interoperable language for machines as well as human experts. There is an opportunity and expectation for IUPAC building on its expertise and reputation as the worldwide recognized authority to take a leading role in setting digital standards that supports accurate exchange of chemistry data and the Open Science agenda. The



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outcomes of this effort will align the highly valuable intellectual scientific work of IUPAC with mechanisms for digital science, facilitate communication worldwide, and better position the Union to contribute to critical efforts for global health and sustainability.

Underlying the ability to apply IUPAC recommendations and outputs for expanding and broad ranging digital applications from chemical naming & drawing software through Artificial Intelligence is the agility of IUPAC's processes and infrastructure to support digital dissemination and fully realise this value for its mission. By establishing guidelines and procedures and implementing FAIR principles for digital assets of equivalent rigor to other IUPAC activities, CPCDS aims to facilitate access to quality scientific data and promote application of the chemical sciences in tackling critical global issues. CPCDS is collaborating both internally and externally to formulate strategy for digital infrastructure, community engagement and sustainability, including emphasis in the following areas:

- ongoing inventory of IUPAC activity outputs that are related to data, notation and other technical specifications,
- guidance for IUPAC projects regarding dissemination and other technical aspects for outcomes related to data and notations
- strategic planning addressing data and digital content curation and management ongoing across IUPAC, including defining and securing intellectual property and capacity
- use cases for adoption that describe supporting services, including emphasis on accessibility for education and monetization for commercial re-use

### **II. Plans and priorities for this biennium, and beyond:**

CPCDS is implementing a multi-pronged strategy to prioritize the above issues in the 2020-21 biennium. Formulation of machine-processable technical descriptions that build on authoritative IUPAC scientific definitions and content is progressing through a number of projects recently launched and in the pipeline in conjunction with Divisions as well as active user groups. Development of standardized metadata that describe the components of critically evaluated data or terminology entries and the establishment of validation criteria to enable systems to check for interoperable representation based on IUPAC standards are two particular areas of focus. Projects are also looking to develop more efficient mechanisms to augment curation practices that adhere to the FAIR Data Principles and preserve provenance links to IUPAC authority. Recent projects include:

- The Phase 2 project for the digital Gold Book is reviewing requirements for an online term management system to facilitate the process of updating the content with current approved IUPAC terminology and broader dissemination with accurate provenance.



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- The Machine-Accessible Periodic Table (MAPT) is a joint project of CPCDS and the CIAAW to develop robust machine-readable specification of the values, associated uncertainties and other descriptive information to ensure accurate reuse of these critically evaluated data in computation and analysis.
- The FAIR Spectroscopic Data project is building on a long history of IUPAC activity to apply the FAIR Data Principles to standards for consistent expression and dissemination of spectroscopic data in online networks.
- The SMILES+ project is formalizing a standard interpretation of the commonly used SMILES notation by chemistry software and cheminformatics toolkits, building on a former open community-based initiative and leveraging the GitHub environment for development work.

To fulfill its remit, CPCDS has established a number of functional groups in the current biennium to ensure regular support for ongoing IUPAC activities, including the following subcommittees:

- The Subcommittee on Publications provides support for the Secretariat regarding publication contracts, the Editorial Boards of *PAC*, *Chemistry International (CI)* and *Chemistry Teacher International (CTI)* to ensure strong content pipelines and liaise with IUPAC Divisions and Committees on issues that impact publication.
- The Subcommittee on Cheminformatics Data Standards will continue to focus on development, dissemination and best practices for application of digital standards through engagement with the cheminformatics community and developing new project areas. A special issue of *PAC* on Cheminformatics Data Standards is planned for spring 2022.
- The Subcommittee on Records & Archives supports the Secretariat in matters of archiving the outcomes and documentation of IUPAC activity, including both print and digital records such as correspondence, web-based materials, social media, datasets and digital cheminformatics artifacts.
- The Gold Book Subcommittee is Joint body of CPCDS and ICTNS that provides stewardship for the content and digital format of the Gold Book, to ensure updates are incorporated appropriately and nuances of meaning across fields are accurately reflected, harmonize the format for presenting terms and verbal definitions with references to original definitions, administer the website and DOI registrations, site security, web accessibility and technical documentation, and coordinate outreach and promotion in conjunction with other IUPAC Divisions and Committees.
- Several CPCDS members also participate in the Interdivisional Subcommittee for Critical Evaluation of Data (ISCED) to facilitate improved dissemination and curation practices.



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CPCDS is actively working to address a number of topical issues that have emerged around publication and digital technologies. Goals include providing the Union with more clear guidance around critical questions of intellectual property and accessibility of digital outputs, and to provide the broader community with guidance on IUPAC's role for supporting the chemical enterprise in the digital era. The following task forces have been convened to address these topics:

- The Task Force on Intellectual Property is working with the Secretariat to develop policies and guidelines that will protect IUPAC's investment and that of its volunteers in the intellectual property that is created by IUPAC in the fulfillment of its mission.
- The FAIR Data Framework Task Force is reviewing IUPAC assets relative to the FAIR criteria to be Findable, Accessible, Interoperable and Reusable by both humans and machines, including a gap analysis across sectors, business considerations necessary for IUPAC to ensure sustainable support digital standards, and coordination with key partners including CODATA, the GO FAIR ChIN, the Research Data Alliance (RDA) and other scientific groups.
- The Task Force on Critical Issues in Scientific Communication is coordinating preparation of a series of white papers focusing on emerging technologies, new areas of science, and current issues in global chemistry to serve as information pieces for IUPAC's NAOs and the broader community. Expert groups are being convened on Blockchain and AI as initial topics.
- The PacifiChem Task Force is organizing a two-day symposium on "Chemistry on the Global Stage: Data, Standards, Infrastructure, and Challenges for the Future" to be held at the quinquennial meeting of the Pacific Rim chemistry societies in December 2021, with a goal to promote IUPAC activities and form a Pacific-based CPCDS subcommittee to facilitate engagement in cheminformatics data standards in these regions.

### **III. An overall report of Division/Committee activities and achievements during the 2018-2019 biennium and through 2020 *organized by the Goals and Objectives laid out in the current IUPAC Strategic Plan.***

CPCDS activities support the IUPAC Mission, particularly "the development of the essential tools for the application and communication of chemical knowledge" through support of IUPAC's publications, databases, and the development of standards for the management, storage, and sharing of digital chemical information. CPCDS' objective is to help build a technical infrastructure that will facilitate the maximum dissemination and usage of IUPAC's content in a digital environment in support of IUPAC's Vision to be an indispensable worldwide resource for chemistry. CPCDS activities and achievements during the 2018-2019 biennium are primarily related to the following goals.



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**Goal #2: Increasing the value of our products and services** (publications, databases, and other intellectual property), and the following strategic objectives:

- 1) Brand IUPAC in the minds of stakeholders,
- 2) Improve the quality and frequency of communication with stakeholders
- 3) Increase revenue and improve long-term financial stability, and
- 4) Enhance interdivisional interaction and collaboration

IUPAC publications and databases serve two main purposes: 1) promotion of IUPAC as a source of indispensable information for the global chemistry community; and 2) generation of revenue to provide financial support for IUPAC activities.

### A. Publications

#### *Pure and Applied Chemistry (PAC)*

The content pipeline for PAC has been strengthened through regular production meetings. Special issues are published periodically to broaden the journal's appeal, including: Chemistry and Cultural Heritage (March 2018), Distinguished Women in Chemistry and Chemical Engineering (February 2019), and IUPAC Distinguished Women in Science in 2021 to honor the women who received the award in Paris during the 2019 World Chemistry Congress. Potential cancellation of IUPAC-endorsed conferences due to COVID-19 could impact future production and more special topic issues are being considered

IUPAC and DeGruyter are celebrated the 60th anniversary of PAC in 2021 with a special journal cover and virtual compilations of important PAC articles from the past. De Gruyter is also planning special events at their booth at both the fall meeting of the American Chemical Society (ACS) in 2020, unfortunately cancelled due to the pandemic.

A special issue on Cheminformatics Standards is being planned by the CPCDS Subcommittee on Cheminformatics Data Standards for April 2022.

#### *Chemistry International (CI)*

CI is currently produced four times/year in print with an online version of the print content hosted on De Gruyter's website. A new initiative to identify the top ten emerging technologies in chemistry each year was launched in 2018. The first annual selection was featured in the April 2019 issue of CI and presented by former CPCDS Chair Bonnie Lawlor at the IUPAC Centenary celebration symposium at the ACS meeting in Orlando (April 2019). Proposals for the 2020 Top Ten Emerging Technologies in Chemistry were highlighted in the October 2020 issue of CI, and a third round of selections is underway.



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CPCDS continues to explore options for *Digital CI* with DeGruyter as they have recently switched to a new publishing platform. We are looking at a variety of new potential business models for CI based on De Gruyter's experience with digital journals and reviewing background documentation just provided.

### *Chemistry Teacher International (CTI)*

CTI was launched in July 2019 as part of an IUPAC project grant and two issues have been published so far (<https://www.degruyter.com/view/journals/cti/cti-overview.xml>). The journal is open access and Article Processing Charges have been established to phase in to support sustainable publication ongoing. CTI was put forth as a trial journal and an assessment should be made at regular points in the future if it should continue.

### *DeGruyter Partnership*

An authentication process to facilitate access from the IUPAC website to IUPAC Publications on the De Gruyter website by IUPAC members and other authorized users was implemented in mid-2018. The IUPAC/De Gruyter contracts for both PAC and CI have officially been extended from December 31, 2021 to December 31, 2023 and both organizations are looking at how to best move forward.

## B. Databases

### *IUPAC Standards Online*

The IUPAC Standards Online database was originally launched in March 2016 as a searchable online interface to IUPAC Standards and Recommendations. De Gruyter offered free access during 2020 as part of the PAC 60th Anniversary celebration and this is being continued through 2021. People will need to register so that information can be gathered for future marketing and development purposes. At the end of the year usage will be analyzed to see who is using the database, how it is being used, and what content is of most interest, and also how best to market and position the content.

### *Compendium of Chemical Terminology (Gold Book)*

The new Gold Book website launched in July 2019. This project enabled deployment of a stable, modern version of the current Gold Book website, a downloadable vocabulary of Gold Book terms and a simple Application Programming Interface (API) for programmatic access to individual terms. This first phase focused on website infrastructure to ensure a secure and stable online environment. Updating content from published Recommendations and supporting ongoing curation of terms is the focus of a new project engaging ICTNS and the Divisions, as described below.



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**Goal #3: Improve the vitality, effectiveness and efficiency of our Union,** and the following strategic objectives:

- 1) Brand IUPAC in the minds of stakeholders,
- 2) Improve the quality and frequency of communication with stakeholders, and
- 3) Enhance interdivisional interaction and collaboration.

CPCDS initiatives that involve technical enhancements and the development of standards aim to serve several purposes for IUPAC and the broader community: 1) facilitate management of quality chemical data globally; 2) expand the utility of authoritative IUPAC information more broadly across disciplines; and 3) support best practices for IUPAC curation of robust machine-readable content.

### Standards for the Storage, Management, and Sharing of Digital Content

The CPCDS Subcommittee on Cheminformatics Data Standards (SCDS) was established in 2016 to engage with interested IUPAC Divisions and Committees, as well as external organizations with interest in quality chemical data to collaborate on the resolution of the pain points in the storage, management, sharing, and usage of digital chemical information. SCDS initiatives in the 2018-2019 biennium are described below, several of which led to successful IUPAC projects.

#### *Cheminformatics Color Book*

The first phase of the Cheminformatics Color Book project was to explore the needs for disseminating machine-readable chemical data standards for automated processes by engaging in outreach discussions worldwide at meetings of the American Chemical Society (ACS), the Royal Society of Chemistry, the Beilstein Institute, the InChI Trust, the European Bioinformatics Institute, the U.S. National Library of Medicine Center for Bioinformatics, the Research Data Alliance, and CODATA, taking into account input from scientific disciplines beyond chemistry and the principles of the GO FAIR movement which IUPAC now supports. A framework for an IUPAC Cheminformatics Color Book was articulated over several discussions that will inform the second phase to implement a digital resource to coordinate and manage source reference material for IUPAC outputs related to cheminformatics and data standards.

#### *Chemical Representation for Computers*

The IUPAC International Chemical Identifier (InChI) is a critical tool for cheminformatics and digital dissemination of chemical information and data. The InChI descriptor generated by a canonical algorithm facilitates the accurate matchup of chemical data and information records when linking between different computer systems. SCDS has contributed to several InChI workshops since 2017 and several CPCDS projects are incorporating InChI as a core feature of the metadata to facilitate interoperability.



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The SMILES (Simplified Molecular-Input Line-Entry System) family of chemical notation is also implemented in many cheminformatics toolkits and databases and complements the canonical identifier function of InChI. SMILES is designed for automated retrieval of structural information and supports substructure searching, molecular pattern matching and parsing of reaction transforms. SMILES is no longer being updated and concern in the cheminformatics community prompted a project to develop open reference documentation that articulates a standard interpretation of SMILES (<https://iupac.org/project/2019-002-2-024>). Formalizing the SMILES specification will also enhance the accuracy of input used to generate canonical InChIs.

### *Standards for Spectral Data and Repositories*

SCDS members participated in a CPCDS Task Force to consider the feasibility of supporting a repository for experimental spectral data. SCDS members have a range of expertise in working with spectral data, including the development of the widely-used IUPAC JCAMP-DX file format ([jcamp-dx.org](http://jcamp-dx.org)). As a result of the feasibility study, a joint workshop was held with CODATA in Amsterdam in July 2018 to flesh out the needs of researchers and NMR equipment vendors. This has led to the successful project proposal for development of a standard for FAIR management of spectroscopic data. The recently approved project will focus on metadata for data publication as well as validation tools and workflows.

### *FAIR Guidelines for Chemical Data*

Since the FAIR Data Principles were published in 2016, SCDS has organized and participated in a number of symposia and workshops to review the criteria and consider what is involved to share data more effectively across disciplines. Many organizations in research and applied sectors are incorporating the principles into both internal processes and outward-facing products and services. As IUPAC evolves its work practices to become more virtual, adopting the FAIR principles will enable the Union to tap into many motifs for digital exchange emerging in the data sciences and informatics expert communities. IUPAC FAIR data and information standards can also play a key role in facilitating reproducibility and replicability of scientific research and communication of authoritative information.

### Systems for Curation of Digitally-Enabled IUPAC Content

#### *Machine-Accessible Periodic Table (MAPT)*

Access to authoritative machine-readable data for the chemical elements was raised at a number of SCDS sponsored symposia, including by scientists in other disciplines as Geochemistry. CPCDS launched a joint project with CIAAW in 2019 to honor the International Year of the Periodic Table by developing machine readable specification of the values, associated uncertainties and other descriptive information associated with the chemical elements. Ensuring these data can be accurately parsed by machine systems will facilitate more accurate



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computation, maintain links to provenance, and expose this content more broadly. This project is supporting CIAAW to align their curation practices with the FAIR Data Principles and exemplifies the complementary role of CPCDS to enhance the viability and value of authoritative IUPAC output.

### *Gold Book Term Management System*

The improved availability of the Gold Book through the new website has generated interest in extending machine representation of chemical concepts to enable new capabilities. The second of three planned phases will identify the requirements for a term management system that supports curation and dissemination of terminology, nomenclature, and symbols for chemistry commensurate with the digital environment. This project will engage all the Divisions to develop a sustainable process for promulgating and reviewing terms and provision them through a system that will more sustainably enable accurate connections into many digital venues such as Wikipedia and online textbooks. Future initiatives will refine the machine representation to support development of chemical ontologies and the semantic web.

### *Solubility Metadata*

The IUPAC Solubility Data Series is a 104-volume series of critically evaluated solubility data. As a part of an effort to digitize this important IUPAC asset, this project will evaluate the structure of the information need to accurately represent the reports of data within the volumes (compilations) of the SDS in addition to the data provided in the critical reports (evaluations) of said data. The project will develop a metadata schema that appropriately (i.e. from a detailed scientific basis) represents the knowledge described in both the compilations and evaluations.

## **IV. Tabular material.**

### **Symposia/Workshops/Webinars**

16-17 Dec. 2021 (*postponed from Dec 2020 due to pandemic*):

*Chemistry on the Global Stage: Data, Standards, Infrastructure, and Challenges for the Future*, a symposium organized by the IUPAC Committee on Publications and Cheminformatics Data Standards to be held at Pacificchem 2020: A Creative Vision for the Future. The meeting is jointly organized by members of the American Chemical Society, the New Zealand Chemical Society, and the Chemical Society of Japan.

14 Apr. 2021 (virtual):

*Framing FAIR in Chemistry*, one of a series of symposia on FAIR jointly organized by the IUPAC Committee on Publications and Cheminformatics Data Standards and the GO FAIR Chemistry Implementation Network to be held at Spring 2021 ACS Meeting originally scheduled for San Antonio. The outputs of this symposium are anticipated to feed into ongoing and future activities in IUPAC and CODATA/GO FAIR.



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2 Feb. 2021 (opening session) :

*Data Sharing Seminar Series for Scientific Societies*, monthly series of conversations with invited speakers who are actively engaged with journals, funders, institutions, repositories, and other research communities on the practices available and challenges yet to be addressed.

Organized jointly with the American Association for the Advancement of Science (AAAS), the American Astronomical Society, the American Chemical Society, the American Geophysical Union, the American Meteorological Society, the Council of Scientific Society Presidents, the Federation of American Societies For Experimental Biology, and the Federation of Associations in Behavioral and Brain Sciences.

17 Aug. 2020 (virtual):

*Making Chemistry FAIRer*, one of a series of symposia on FAIR jointly organized by the IUPAC Committee on Publications and Cheminformatics Data Standards and the GO FAIR Chemistry Implementation Network to be held at Fall 2020 ACS Meeting originally scheduled for San Francisco. The outputs of this symposium are anticipated to feed into ongoing and future activities in IUPAC and CODATA/GO FAIR.

23-24 Mar. 2020 (*cancelled due to pandemic*):

*The Current State of FAIR Chemical Data*, a two-day symposium jointly organized by the ACS Division of Chemical Information, the IUPAC Committee on Publications and Cheminformatics Data Standards and the GO FAIR Chemistry Implementation Network was to be held at the Spring 2020 ACS meeting in Philadelphia. The meeting was cancelled due to the COVID-19 pandemic. Planning is underway to address various themes of FAIR and chemistry data across a number of future symposia in which IUPAC CPCDS will also take part.

25-29 Aug. 2019:

*Chemical Nomenclature and Representation: Past, Present and Future*, a symposium organized by the IUPAC Committee on Publications and Cheminformatics Data Standards jointly with the CSA Trust, ICTNS, and the ACS Committee on Chemical Nomenclature under the auspices of the Division of Chemical Information of the American Chemical Society (ACS) at the ACS meeting on San Diego, CA.

5-12 Jul. 2019:

*Digital Chemistry and the Lab of the Future*, a symposium organized by the IUPAC Committee on Publications and Cheminformatics Data Standards to be held at the 2019 IUPAC World Chemistry Congress in Paris, France.

1 Apr. 2019:



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*Creating a Common Language for Chemistry: IUPAC's Role - Past, Present, and Future*, a symposium organized by the IUPAC Committee on Publications and Cheminformatics Data Standards in cooperation with the ACS Division of Chemical Information at the Spring 2020 ACS meeting in Orlando, FL.

30-31 Mar. 2019:

*FAIR Publishing Guidelines for Spectral Data and Chemical Structures*, a workshop sponsored by NSF and jointly organized by members of the CPCDS Subcommittee on Cheminformatics Data Standards and the ACS Division of Chemical Information, in conjunction with the Spring 2019 ACS meeting in Orlando, FL.

### Publications

McEwen, L. Towards a Digital IUPAC. *Chem Int.* **2019**, 42 (2), 15-17.

<https://doi.org/10.1515/ci-2020-0203>

Coles, S. J.; Frey, J. G.; Willighagan, E. L.; Chalk, S. J. Taking FAIR on the ChIN: The Chemistry Implementation Network. *Data Intel.* **2020**, 2 (1-2), 131-

138. [https://doi.org/10.1162/dint\\_a\\_00035](https://doi.org/10.1162/dint_a_00035)

Stall, S.; McEwen, L.; Wyborn, L.; Hoebelheinrich, N.; Bruno, I. Growing the FAIR Community at the Intersection of the Geosciences and Pure and Applied Chemistry. *Data Intel.* **2020**, 2 (1-2), 139-150. [https://doi.org/10.1162/dint\\_a\\_00036](https://doi.org/10.1162/dint_a_00036)

Chalk, S. The IUPAC Gold Book. *IUPAC 100 Stories*. Jul. 29, 2019, story 0.13.

<https://iupac.org/100/stories/the-iupac-gold-book>

Hepler-Smith, E.; McEwen, L. A Century of Nomenclature for Chemists and Machines. *Chem Int.* **2019**, 41 (3), 46-49. <https://doi.org/10.1515/ci-2019-0315>

Clark, A. M.; McEwen, L.R.; Gedeck, P.; Bunin, B. A. Capturing mixture composition: an open machine-readable format for representing mixed substances. *J. Cheminform.* **2019**, 11, article 33. <https://doi.org/10.1186/s13321-019-0357-4>

Lawlor, B. A Common Language for Chemistry and More. *IUPAC 100 Stories*. Mar. 21, 2019, story 0.9. <https://iupac.org/100/stories/a-common-language-for-chemistry>

### Projects

INCHI OPEN EDUCATION RESOURCE (OER)



INTERNATIONAL UNION OF  
PURE AND APPLIED CHEMISTRY

<https://iupac.org/project/2018-012-3-024>

*Chair: Robert Belford*

IUPAC SMILES+ SPECIFICATION

<https://iupac.org/project/2019-002-2-024>

*Chair: Vincent Scalfani*

MACHINE-ACCESSIBLE PERIODIC TABLE

<https://iupac.org/project/2019-020-2-024>

*Chairs: Leah McEwen, Juris Meija*

DEVELOPMENT OF A STANDARD FOR FAIR DATA MANAGEMENT OF  
SPECTROSCOPIC DATA

<https://iupac.org/project/2019-031-1-024>

*Chairs: Robert Hanson, Damien Jeannerat*

DEVELOPMENT OF AN IUPAC RECOMMENDED TERM MANAGEMENT SYSTEM FOR  
EXPANSION OF THE COVERAGE OF THE IUPAC COMPENDIUM ON CHEMICAL  
TERMINOLOGY

<https://iupac.org/project/2019-032-1-024>

*Chair: Stuart Chalk*

Development of a metadata schema for critically evaluated solubility measurement data

<https://iupac.org/project/2020-018-1-024>

*Chair: Stuart Chalk*



## INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

19.5 Interdivisional Committee on Terminology, Nomenclature and Symbols (ICTNS)  
Report to Council Prof. Jürgen Stohner

### IUPAC GA Virtual Meeting Montreal 2021

Executive Summary dated 5 July 2021

[This report extends and completes ICTNS proceedings until end of 2020 extending the summary provided to the IUPAC Council in Paris, France, in May 2019.](#)

During the six-year period 01 Jan 2015 to 31 Dec 2020, ICTNS continued its activities on behalf of IUPAC. It has reviewed, edited and approved for publication (68) Recommendations and Technical Reports in Pure and Applied Chemistry (PAC) for a total of (2124) journal pages (Table 1). The activities of ICTNS are summarized in the two tables within the Appendix below. Information is complete for PAC volumes 92, the January to December 2020 issues.

For the same six-year period (Table 2), ICTNS carried out editing for the completed projects that culminated in 14 books that include a Colour Books, *viz.* the Silver Book Compendium of Terminology and Nomenclature of Properties of Clinical Laboratory Sciences 211 pp. All books bear the label of IUPAC. The total book pages edited to ensure adherence to IUPAC requirements numbers 6,240 since 2015. No book was edited in the year 2020.

The data are supplemented with data starting in January 1, 2018, when I took over the ICTNS Chair from Ron Weir. I want to mention here that I am proud to follow my predecessor as Chair of ICTNS and I express my gratitude to him for his tremendous commitment to the benefit of ICTNS and IUPAC. I am happy that he is still willing to answer my questions on the phone when I need his advice.

The ICTNS continued its consultation and advisory work with several international societies and agencies on which ICTNS has representation that include the BIPM. One important issue dealt with during the reporting period with the BIPM concerned the definition of the mole and ancillary matters. The ICTNS was part of the Task Group examining the definition of the mole and way ahead. Manuscripts are with reviewers for PAC. In addition, ICTNS provided the on-going resource for the Secretariat in dealing with queries from scientists, engineers, teachers, students and the general public on terminology, nomenclature, symbols and units.

The Chair acknowledges the members of the ICTNS who have shouldered the heavy workload as described in the detailed Appendix and its extension below. The 2019/20 biennium members of ICTNS are the Secretary Professor D. Brynn Hibbert (Australia); TMs are Dr. Milan Drabik (Slovakia), Dr. Jan Kaiser (UK) and Dr. Gerard Moss (UK); the AMs are Dr. Juris Meija (Canada) and Professor Marcy Towns (USA); the representatives from the Divisions and other international organisation are Drs. Marie-Noelle Bourquin, Carol Brock, Rita Cornelis, Ture Damhus, P.S. Fedotov, Merce Ferres Hernandez, Pavel Karen, M. Clara F. Magalhaes, Graeme Moad, Amelia P. Rauter, Chris Southan, Michael Spedding, Robert Wielgosz and Ron Weir.

The Chair also thanks the staff at the Secretariat for their very valuable assistance especially Fabienne Meyers, Cheryl Wurzbacher, Lynn Soby, Enid Weatherwax and at De Gruyter publishing Joshua Gannon, Katharina Kaupen and Theresa Haney.

My four-year appointment as Chair ICTNS started on 1 Jan 2018. As volunteers to the work of IUPAC via ICTNS, I appreciate the sacrifices all of you have made and will make to help maintain the IUPAC goal for a common scientific currency in the world. Your reviews have been excellent and your comments have been helpful and important to me in making the decisions. I thank each of you!

Members are reminded of the following motion as Minute 17 passed at the 89<sup>th</sup> IUPAC Bureau meeting held 17-18 Apr 2010 in Sofia, Bulgaria.

[http://old.iupac.org/news/archives/2010/bureau\\_min\\_sofia\\_2010.pdf](http://old.iupac.org/news/archives/2010/bureau_min_sofia_2010.pdf).

#### **17. REAFFIRMATION OF THE ROLE OF ICTNS**

The Chairman of ICTNS, Prof. Weir, submitted a Briefing Note to the Secretary General requesting a statement of continuing support from the IUPAC Bureau or Executive Committee that acknowledges the responsibilities of ICTNS to enforce existing IUPAC Recommendations in publications sponsored by IUPAC and to maintain cooperation with international bodies on which IUPAC is represented. The Briefing Note may be found in the Agenda Book.

Prof. Black discussed the historical implications of this matter and introduced the following Motion: *The Bureau reasserts its strong support for the responsibilities of ICTNS to enforce existing IUPAC Recommendations in publications sponsored by IUPAC and to maintain cooperation with international bodies on which IUPAC is represented.* This motion was seconded by several Bureau members and was unanimously passed without discussion.

### **1. ICTNS Report, 01 January 2015 to 31 December 2020**

#### **1.1 Terms of Reference of ICTNS**

These include:

(i) To be responsible for submission to the Bureau/Council, in accordance with Bylaw 2.11, for publication or otherwise, any IUPAC document concerned with terminology, nomenclature, symbols and other conventions.

(ii) Before recommending any material for publication as an IUPAC document, to ensure that

full consultations have taken place, and the widest possible consensus has been reached among all Divisions and other bodies of the Union, and between IUPAC and other ICSU bodies, the international standardizing organizations, and Conférence Générale des Poids et Mesures (CGPM) and its Committees.

(iii) To ensure, via each Division's Titular Member on ICTNS, that all documents for publication emanating from that Division have been subject to a satisfactory level of review of substantive material by the Division Committee.

(iv) To ensure that any considered IUPAC view shall carry the fullest possible weight among other international organizations, all negotiations on matters concerned with nomenclature and symbols with other ICSU bodies, with the international standardizing organizations, and with CGPM and its Committees, shall be conducted through ICTNS, which shall advise the Executive Committee accordingly.

(v) To be responsible, after consultation with all relevant bodies of IUPAC, for the official IUPAC comments on all documents on nomenclature, symbols, terminology and conventions sent to the Union for comment.

(vi) To advise the President and the Executive Committee on suitable persons for appointment as representatives of IUPAC on other bodies concerned with nomenclature, symbols and terminology.

As a consequence, ICTNS is responsible for editing and approving the content of IUPAC Recommendations and Technical Reports for publication in *Pure and Applied Chemistry*, for approving publication of IUPAC reports in journals other than PAC that include publication of reports that contain new experimental data, for reviewing IUPAC-sponsored books for adherence to IUPAC standards of Terminology, Nomenclature, Symbols and Units, and also for approving, on behalf of IUPAC, publications emanating from international bodies on which IUPAC has representation. Editing of these publications is carried out by the respective organisation.

The ICTNS carries out these tasks by very extensive review processes. For IUPAC Recommendations, a Public Comment Period of five months is required, with input from members of ICTNS within three months. Both Recommendations and Technical Reports are carefully scrutinized for conformity with IUPAC-approved Terminology, Nomenclature, Symbols and Units, and are also edited carefully for scientific content. For those documents whose source lies with international bodies, ICTNS also carries out careful reviews.

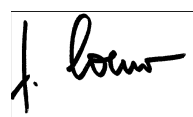
The overall goal from these activities is to continue to enhance the reputation of IUPAC as a source of international standards in chemical terminology and nomenclature through publication of *Pure and Applied Chemistry* and continuing interaction with international organisations.

Publication of the on-line Gold Book *IUPAC Compendium on Chemical Terminology* provides an opportunity for nearly continuous update of IUPAC-approved terminology, as well as corrections where required. The ICTNS maintains up-to-date and detailed instructions for the preparation of publication for *Pure and Applied Chemistry* and also acts as a consulting resource for the Secretariat and other IUPAC bodies in answering queries from professionals and students on problems in terminology and nomenclature.

The Terms of Reference require ICTNS to conduct, and advise the Executive Committee accordingly, all negotiations concerned with nomenclature, terminology and symbols with other ICSU bodies, with international standardizing organisations, and with CGPM and its committees. This measure ensures that IUPAC views carry the fullest possible weight among other international organisations. In practice, ICTNS maintains contacts with IUPAC representatives on these organisations and also through ICTNS members from the Bureau International des Poids et Mesures (BIPM), International Organisation for Standardization (ISO), and the International Unions for Biochemistry and Molecular Biology (IUBMB), Crystallography (IUCr), Pharmacology (IUPHAR), and Pure and Applied Physics (IUPAP).

## 2.0 Changes to Operating Procedures

Nil



Juergen Stohner, Chair

D. Brynn Hibbert, Secretary

PS. Our current agenda: (1) Guidelines for preparing Technical Reports and Recommendations; (2) Procedure for preparing Gold Book entries and their revisions; (3) Joint Subcommittee (CPCDS & IUPAC) to manage the Gold Book content and maintain a high digital standard of the Gold Book online database.

## APPENDIX

### A 1.0 Summary of Publications in *PAC* for the period 01 January 2017 to 31 Dec 2020

The previous biennial reports by Professors J.W. Lorimer and R.D. Weir covered the periods from 01 June 2005 to 30 June 2009 (Lorimer), from 01 July 2009 to 30 June 2011 (Weir), 01 July 2011 to 31 May 2013 (Weir), from 01 June 2013 to 30 June 2015 (Weir), 01 July 2015 to 31 December 2017 (Weir), from 01 January 2018 (Stohner) respectively. In the following summary, the reference number, title, author names, and the project origination follow the entries shown within Manuscript Central.

To assess any trends in the results from work by ICTNS, the statistics for the entire 16-year period June 2005 to 31 December 2020 are summarised in Table 1. Shown are the total numbers of Reports and Recommendations that were processed. These are subdivided by journal pages reviewed for each category. Also shown are the numbers of revised versions of manuscripts that ICTNS processed as a consequence of the review process. Also listed are the total and average number of months elapsed between manuscript submission and publication in *PAC*.

In section 1.1.1 below, there are listed the details of the manuscripts processed for the four-year period 01 January 2017 to 31 December 2020. Included are the titles, authors, *PAC* issue, dates of receipt and publication of each manuscript and the number of revised versions processed. Note that the detailed list of papers published in 2016 and before are excluded to shorten this report since that these details were published previously.

**Table 1. Volume of Technical Reports and Recommendations processed by ICTNS**

	Total Articles							Technical Reports						Recommendations					
<i>PAC</i> vol.	Total Articles			Note 1	Note 2	Note 3	Note 4	Technical Reports			Note 1	Note 2	Note 3	Recommendations			Note 1	Note 2	Note 3
	#	pages pp	avg. pp	# revisions	# Mos	avg mos	avg mospr	#	pages pp	avg. pp	# revisions	# mos	avg mos	#	pages pp	avg pp	# revisions	# mos	avg mos
77 (2005)	12	414	35	-	-	-	-	9	267	30	-	-	-	3	147	49	-	-	-
78 (2006)	13	354	27	-	-	-	-	8	168	21	-	-	-	5	186	37	-	-	-
79 (2007)	8	466	58	-	-	-	-	4	135	34	-	-	-	4	331	83	-	-	-
80 (2008)	12	463	39	-	-	-	-	6	168	28	-	-	-	6	295	48	-	-	-
81 (2009)	13	455	37	-	-	-	-	10	250	27	-	-	-	3	205	68	-	-	-
82 (2010)	10	266	27	-	-	-	-	8	170	21	-	-	-	2	96	48	-	-	-
83 (2011)	20	657	33	39	224	11	6	11	366	33	20	89	8	9	291	32	19	135	15
84 (2012)	12	450	38	14	100	8	7	7	169	24	9	62	9	5	281	56	5	38	8
85 (2013)	18	592	33	35	267	15	8	11	293	27	18	131	12	7	299	43	17	136	19
86 (2014)	16	443	28	21	147	9	7	13	397	31	15	106	8	3	46	15	6	41	14
87 (2015)	8	140	17	14	60	8	4	5	76	15	11	36	7	3	64	21	3	24	8
88 (2016)	16	432	27	32	162	10	5	8	162	20	16	77	10	8	270	34	16	85	9
89 (2017)	4	118	39	6	32	8	5	2	53	27	2	8	4	2	65	33	4	24	12
90 (2018)	16	826	52	56	293	18	5	11	584	53	34	144	13	5	242	48	22	149	29
91 (2019)	9	163	18	21	90	10	4	7	120	17	16	62	9	2	43	22	5	28	14
92 (2020)	15	445	30	39	164	11	4	9	215	24	24	74	8	6	230	38	15	90	15

Note 1. Total number of revisions processed by ICTNS. Note 2. Total number of months elapsed between submission date and on line publication in PAC. Note 3. Average number of months elapsed per manuscript. Note 4. Average number of months elapsed per revision.

**Table 2. Books processed by ICTNS for the period  
01 January 2015 to 31 December 2020**

<b>Year</b>	<b>Medium</b>	<b>Pages</b>	<b>Pages</b>
<b>2016</b>	<b>Chemistry Beyond Chlorine</b>		<b>599</b>
<b>2016</b>	<b>Successful Drug Discovery Vol II</b>		<b>315</b>
<b>2017</b>	<b>Chemical Issues in Biomass Burning in sub-Saharan Africa</b>		<b>152</b>
<b>2017</b>	<b>Successful Drug Discovery Vol III</b>		<b>605</b>
<b>2017</b>	<b>Glossary of Terms in Reproductive and Developmental Toxicology (Royal Society of Chemistry publisher)</b>		<b>600</b>
<b>2018</b>	<b>Biomass Burning in Sub-Saharan Africa Chemical Issues and Action Outreach (Springer publisher)</b>		<b>167</b>
<b>2018</b>	<b>Glossary of Terms used in Molecular Toxicology</b>		<b>426</b>
<b>2019</b>	<b>Successful Drug Discovery Vol IV (Wiley/VCH publisher)</b>		<b>336</b>
<b>2020</b>	<b>none</b>		
	<b>Σ</b>	<b>1562 (0)</b>	<b>7390 (3200)</b>
	<b>ΣΣ = 8952 pages</b>		

**A 1.1 Publications reviewed, edited and approved by ICTNS for publication in *Pure and Applied Chemistry***

***Total number of Recommendations (Recs) and Technical Reports (TRs):***

***Four-year period 01 Jan 13 to 31 Dec 16:  $\Sigma$  Recs + TRs = 58; pages = 1607***

***Four-year period 01 Jan 14 to 31 Dec 17:  $\Sigma$  Recs + TRs = 44; pages = 1133***

***Four-year period 01 Jan 15 to 31 Dec 18:  $\Sigma$  Recs + TRs = 44; pages = 1516***

***Four-year period 01 Jan 16 to 31 Dec 19:  $\Sigma$  Recs + TRs = 45; pages = 1539***

***Four-year period 01 Jan 17 to 31 Dec 20:  $\Sigma$  Recs + TRs = 44; pages = 1552***

**A 1.1.1 IUPAC Recommendations for four-year period 01 Jan 2017 to 31 Dec 2020**

***Total number: 15***

***Total pages published: 580***

PAC-REC-16-02-02 *How to name atoms in phosphates, polyphosphates, their derivatives and mimics, and transition state analogues for enzyme-catalysed phosphoryl transfer reactions*, G. Michael Blackburn, Jacqueline Cherfils, Gerard P. Moss, Nigel G.J. Richards, Jonathon P. Waltho, Nicholas H. Williams, and Alfred Wittinghofer, - Div. III, PAC 89(5) 653-675 (2017), 23 pp.

*04 Feb 2016 – 12 Jan 2017; 12 months; 2 revisions.*

PAC-REC-16-05-02 *Preferred names of constitutional units for use in structured-based names of polymers*, Werner Mormann, Karl-Heinz Hellwich, Jianzhong Chen and Edward S. Wilks, - Div. IV & VIII, PAC 89(11) 1695-1736 (2017), 42 pp.

*28 May 2016 – 09 May 2017; 12 months; 2 revisions.*

PAC-REC-17-01-11 *Terminology of separation methods*, Maryutina, T. A., Savonina, E. Yu., Fedotov, P. S., Smith, R. M., Siren, H. and Hibbert, D. B. - Div. II, PAC 90(1), 181-231 (2018), 50 pp.

*28 January 2017 - 16 July 2017; 6 months; 2 revisions.*

PAC-REC-17-01-06 *Definition of the mole*, Marquardt, R., Meija, J., Mester, Z., Towns, M., Weir, R., Davis, R. and Stohner, J. - Div. I, II, V, CCE, ICTNS, PAC 90(1), 175-180 (2018), 6 pp.

*11 January 2017 - 12 September 2017; 8 months; 2 revisions.*

PAC-REC-11-06-13 *Vocabulary on nominal property, examination, and related concepts for clinical laboratory sciences*, Nordin, G., Dybkaer, R., Forsum, U., Fuentes-Arderiu, X., and Pontet, F. - PAC 90(5), 913-935 (2018), 50 pp.

*29 June 2011 - 6 September 2017; 73 months; 11 revisions.*

PAC-REC-16-11-20 *Terminology of bioanalytical methods*, Labuda, J., Bowater, R. P., Fojta, M., Gauglitz, G., Glatz, Z., Hapala, I., Havlis, J., Kilar, F., Kilar, A., Malinowska, L., Siren, H. M. M., Skladal, P., Torta, F., Valachovic, M., Wimmerova, M., Zdrahal, Z., Hibbert, D. B. - PAC 90(7), 1121-1198 (2018), 78 pp.

*21 November 2016 - 1 February 2018; 14 months; 4 revisions.*

PAC-REC-13-09-19 *Nomenclature of flavonoids*, Rauter, A. P., Ennis, M., Hellwich, K.-H., Herold, B. J., Horton, D., Moss, G. P., and Schomburg, I. - Div. VIII, PAC 90(9), 1429-1486 (2018), 58 pp.

*22 September 2013 - 18 September 2017; 48 months; 3 revisions.*

PAC-REC-16-12-17 *Nomenclature and terminology for dendrimers with regular dendrons and for hyperbranched polymers*, Fradet, A., Chen, J., Hellwich, K.-H., Horie, K., Kahovec, J., Mormann, W., Stepto, R. F.T., Vohlidal, J. and Wilks, E. S. - Div. VIII, PAC 91(3), 523-561 (2019), 39 pp.

*12 December 2016 - 4 November 2018; 23 months; 4 revisions.*

PAC-REC-18-07-13 *Definition of the chalcogen bond*, Aakeroy, C. B., Bryce, D. L., Desiraju, G., Frontera, A., Legon, A. C., Nicotra, F., Rissanen, K., Scheiner, S., Terraneo, G., Metrangolo, P. and Resnati, G. - Div. NN, PAC 91(11), 1889-1892 (2019), 4 pp.

*11 July 2018 - 3 December 2018; 5 months; 1 revision.*

PAC-REC-17-10-07 *Nomenclature and terminology for linear lactic acid-based polymers (IUPAC Recommendations 2019)*, Vert, M., Chen, J., Hellwich, K.-H., Hodge, Ph., Nakano, T., Scholz, C., Slomkowski, S., Vohlidal, J. - PAC 92(1), 193-211 (2020), 19 pp.

*16 October 2017 - 19 July 2019; 21 months; 3 revisions.*

PAC-REC-18-02-05 *Nomenclature for boranes and related species (IUPAC Recommendations 2019)*, Beckett, M., Brellochs, B., Chizhevsky, I., Damhus, T., Hellwich, K.-H., Kennedy, J., Laitinen, R., Powell, W., Rabinovich, D., Viñas, C., Yerin, A. - PAC 92(2), 355-381 (2020), 27 pp.

*16 February 2018 - 6 July 2019; 17 months; 3 revisions.*

PAC-REC-18-01-09 *Terminology of electrochemical methods of analysis*, Hibbert, D., Pingarron, J., Labuda, J., Barek, J., Brett, C., Camões, M., Fojta, M. - PAC 92(4), 641-694 (2020), 54 pp.

*30 January 2018 - 20 May 2019; 15 months; 2 revisions.*

PAC-REC-19-04-09 *Definitions and notations relating to tactic polymers*, Moad, G., Fellows, C., Hellwich, K.-H., Meille, S., Nakano, T., Vert, M. - PAC 92(11), 1769-1779 (2020), 19 pp.

*17 April 2019 - 21 August 2019; 4 months; 1 revision.*

PAC-REC-19-04-04 *Glossary of Methods and Terms used in Surface Chemical Analysis*, Hibbert, D., Takeuchi, T., McQuillan, J., Shard, A., Russell, A. - PAC 92(11), 1781-1860 (2020), 80 pp.

*5 April 2019 - 12 May 2020; 13 months; 3 revisions.*

PAC-REC-18-12-15 *Terminology of Polymers in Advanced Lithography*, Jones, R. G., Ober, C., Hayakawa, T., Luscombe, C., Stingelin, N. - PAC 92(11), 1861-1891 (2020), 31 pp.

*18 December 2018 - 15 July 2020; 20 months; 3 revisions.*

### A 1.1.2 IUPAC Technical Reports for four-year period 01 Jan 2017 to 31 Dec 2020

*Total number: 29*

*Total pages published: 972*

PAC-REP-16-08-08 *A critical review of the proposed definitions of fundamental chemical quantities and their impact on chemical communities*, Roberto Marquardt, Juris Meija, Zoltan Mester, Marcy Towns, Ron Weir, Richard Davis and Jurgen Stohner, Div. I, II, V, CCE, ICTNS, PAC 89(7) 951-981 (2017), 31pp.

*24 Aug 2016 – 23 Mar 2017; 7 months; 2 revisions.*

PAC-REP-17-06-10 *Calibration, standardization, and quantitative analysis of multidimensional fluorescence (MDF) measurements on complex mixtures*, Alan G. Ryder, Colin A. Stedmon, Niels Harrit, and Rasmus Bro, Div. IV & VIII, PAC 89(12) 1849-1870 (2017), 22 pp.

*29 Jun 2017 – 24 Jul 2017; 1 month; 0 revisions.*

PAC-REP-16-04-02 *Interpreting and propagating the uncertainty of the standard atomic weights*, Possolo, A., van der Veen, A. M. H., Meija, J., Hibbert, D. B. - Div. NN, PAC 90(2), 395-424 (2018), 30 pp.

*1 April 2016 - 10 October 2017; 17 months; 4 revisions.*

PAC-REP-17-04-10 *Mass and volume in analytical chemistry*, Camoes, M. F., Christian, G. D., and Hibbert, D. B. - Div. NN, PAC 90(3), 563-603 (2018), 40 pp.

*27 April 2017 - 22 November 2017; 7 months; 3 revisions.*

PAC-REP-16-09-10 *Risk assessment of effects of cadmium on human health*, Nordberg, G. F., Bernard, A., Diamond, G. L., Duffus, J. H., Illing, P., Nordberg, M., Bergdahl, I. A., Jin, T., and Skerfving, S. - Div. NN, PAC 90(4) 755-808 (2018), 54 pp.

*12 September 2016 - 20 October 2017; 13 months; 4 revisions.*

PAC-REP-17-03-01 *Clarification of the term ‘normal material’ used for standard atomic weights*, Coplen, T. B., Holden, N. E., Wieser, M. E., and Bohlke, J. K. - Div. NN, PAC 90(7), 1221-1224 (2018), 4 pp.

*3 March 2017 - 20 December 2017; 9 months; 2 revisions.*

PAC-REP-17-10-08 *Properties and units in the clinical laboratory sciences part XXIV. Properties and units in clinical molecular genetics*, Petersen, U. M., Padro-Miquel, A., Taylor, G., Hertz, J. M., Ceder, R., Fuentes-Arderiu, X., and den Dunnen, J. T. - Div. VII, PAC 90(7), 1199-1220 (2018), 22 pp.

*31 October 2017 - 7 March 2018; 4 months; 1 revision.*

PAC-REP-17-01-02 *Engineered nanomaterials and human health: Part 2. Applications and nanotoxicology*, Gubala, V., Johnston, L. J., Krug, H. F., Moore, C. J., Ober, C. K., Schwenk, M., and Vert, M. - Div. NN, PAC 90(8) 1325-1356 (2018), 32 pp.

*4 January 2017 - 20 December 2017; 12 months; 3 revisions.*

PAC-REP-17-01-01 *Engineered nanomaterials and human health: Part I. Preparation, functionalization and characterization*, Gubala, V., Johnston, L. J., Liu, Z., Krug, H., Moore, C. J., Ober, C. K., Schwenk, M., and Vert, M. - PAC 90(8) 1283-1324 (2018), 42 pp.

4 January 2017 - 19 April 2018; 15 months; 5 revisions.

PAC-REP-17-06-05 *The ongoing challenge of novel psychoactive drugs of abuse. Part I. Synthetic cannabinoids*, Abbate, V., Schwenk, M., Presley, B. C., and Uchiyama, N. - Div. NN, PAC 90(8) 1255-1282 (2018), 28 pp.

15 June 2017 - 19 April 2018; 10 months; 4 revisions.

PAC-REP-17-06-03 *Standard reporting of Electrical Energy per Order (E-EO) for UV/H<sub>2</sub>O<sub>2</sub> reactors*, Keen, O., Bolton, J., Litter, M., Bircher, K., and Oppenlaender, T. - Div. VI, PAC 90(9) 1487-1499 (2018), 13 pp.

9 June 2017 - 23 November 2017; 6 months; 1 revision.

PAC-REP-17-06-03 *On the discovery of new elements (IUPAC/IUPAP Provisional Report) Provisional Report of the 2017 Joint Working Group of IUPAC and IUPAP*, Hofmann, S., Dmitriev, S. N., Fahlander, C., Gates, J. M., Roberto, J. B. and Sakai, H. - Div. VI, PAC 90(11) 1773-1832 (2018), 59 pp.

9 June 2017 - 23 November 2017; 6 months; 1 revision.

PAC-REP-15-07-03 *IUPAC Periodic Table of the Elements and Isotopes (IPTEI) for the Education Community*, Holden, N. E., Coplen, T. B., Bohlke, J. K., Tarbox, V. L., Benefield, J., de Laeter, J. R., Mahaffy, P. G., O'Connor, G., Roth, E., Tepper, D. H., Walczyk, T., Wieser, M. E., and Yoneda, S. - Div. II & CCE, PAC 90(12) 1833-2092 (2018), 260 pp.

3 April 2015 - 23 July 2018; 39 months; 4 revisions.

PAC-REP-18-05-04 *Erratum: Isotope-abundance variations and atomic weights of selected elements: 2016*, Coplen, T. B. and Shrestha, Y. - Div. II, PAC 91(1) 173 (2019), 1 p.

14 May 2018 - 4 November 2018; 6 months; 2 revisions.

PAC-REP-18-02-02 *International Standard for viscosity at temperatures up to 473 K and pressures below 200 MPa*, Fernandez, J., Assael, M. J., Enick, R. M., and Trusler, J. P. M. - Div. I, PAC 91(1) 161-172 (2019), 12 p.

6 February 2018 - 23 July 2018; 6 months; 1 revision.

PAC-REP-18-06-05 *Recent advances in analysis of trace elements in environmental samples by X-ray based techniques*, Terzano, R., Denecke, M. A., Falkenberg, G., Miller, B., Paterson, D. and Janssens, K. - Div. NN, PAC 91(6) 1029-1063 (2019), 35 p.

21 June 2018 - 13 March 2019; 9 months; 3 revisions.

PAC-REP-18-09-17 *List of keywords for polymer science*, Slomkowski, S., Fellows, C. M., Hiorns, R. C., Jones, R. G., Kubisa, P., Luscombe, C. K., Nakano, T., Russell, G. T., dos Santos, C. G., Scholz, C., Stingelin, N., and Walter, M. G. - Div. NN, PAC 91(9) 997-1027 (2019), 31 p.

24 September 2018 - 21 February 2019; 5 months; 1 revision.

PAC-REP-17-12-04 *Guidelines for unequivocal structural identification of compounds with*

*biological activity of significance in food chemistry*, Molyneux, R. J., Beck, J. J., Colegate, S. M., Edgar, J. A., Gaffield, W., Gilbert, J., Hofmann, T., McConnell, L. L. and Schieberle, P. - Div. NN, PAC 91(8) 1417-1437 (2019), 21 p.

*21 December 2017 - 5 May 2019; 10 months; 3 revisions.*

PAC-REP-18-11-08 *Critically evaluated propagation rate coefficients for radical polymerizations: acrylates and vinyl acetate in bulk*, Hutchinson, R. A. and Beuermann, S. - Div. NN, PAC 91(11) 1883-1888 (2019), 6 p.

*17 November 2018 - 19 July 2019; 8 months; 2 revisions.*

PAC-REP-17-12-03 *An inter-comparison of isotopic composition of neon via chemical assays and thermal analyses*, Steur, P. P. M., Yang, I., Kim, J. S., Nakano, T., Nagao, K. and Pavese, Franco. - Div. NN, PAC 91(11) 1869-1882 (2019), 14 p.

*21 December 2017 - 10 June 2019; 18 months; 4 revisions.*

PAC-REP-19-01-04 *Brief guide to the nomenclature of organic chemistry*, Hartshorn, R., Hellwich, K.-H., Yerin, A., Damhus, T., Hutton, A. – PAC 92(3), 527-539 (2020), 13 pp.

*10 January 2019 – 20 August 2019; 7 months; 2 revisions.*

PAC-REP-18-06-02 *A concise guide to polymer nomenclature for authors of papers and reports in polymer science and technology*, Hodge, P., Hellwich, K.-H., Hiorns, R., Jones, R.G., Kahovec, J., Luscombe, C., Purbrick, M., Wilks, E. – PAC 92(5), 793-813 (2020), 21 pp.

*18 June 2018 – 27 March 2019; 9 months; 2 revisions.*

PAC-REP-2020-2926 *On the discovery of new elements (IUPAC/IUPAP Report)*, Hofmann, S., Dmitriev, S.N., Fahlander, C., Gates, J.M., Roberto, J.B., Sakai, H. – PAC 92(9), 1387-1446 (2020), 60 pp.

PAC-REP-2019-0809 *Interlaboratory comparison of humic substances compositional space as measured by Fourier Transform Ion Cyclotron Resonance Mass Spectrometry*, Perminova, I.V., Zhrebker, A., Kim, S., Schmitt-Kopplin, P., Spencer, R., Lechtenfeld, O., Podgorski, D., Hertkorn, N., Harir, M., Nurfajrin, N., Koch, B., Nikolaev, E., Shirshin, E., Kats, D., Berezin, S., Rukhovich, G. – PAC 92(9), 1447-1467 (2020), 21 pp.

*16 August 2019 – 22 April 2020; 8 months; 2 revisions.*

PAC-REP-19-04-05 *Structure, processing and performance of UHMWPE, Part 1: Characterizing molecular weight*, Bucknall, C., Altstädt, V., Auhl, D., Buckley, P., Dijkstra, D., Galeski, A., Gögelein, C., Handge, U.A., He, J., Liu, C.-Y., Michler, G., Piorkowska, E., Slouf, M., Vittorias, I., Wu, J.J., Bucknall, C. – PAC 92(9), 1469-1483 (2020), 15 pp.

*6 April 2019 – 20 March 2020; 11 months; 4 revisions.*

PAC-REP-19-04-03 *Structure, processing and performance of UHMWPE, Part 2: Crystallinity, entanglement and supra-molecular structure.*, Bucknall, C., Altstädt, V., Auhl, D., Buckley, P., Dijkstra, D., Galeski, A., Gögelein, C., Handge, U.A., He, J., Liu, C.-Y., Michler, G., Piorkowska, E., Slouf, M., Vittorias, I., Wu, J.J. – PAC 92(9), 1485-1501 (2020), 17 pp.

*5 April 2019 – 20 March 2020; 11 months; 3 revisions.*

PAC-REP-19-04-06 *Structure, processing and performance of UHMWPE, Part 3: Deformation, wear and fracture*, Bucknall, C., Altstädt, V., Auhl, D., Buckley, P., Dijkstra, D., Galeski, A., Gögelein, C., Handge, U.A., He, J., Liu, C.-Y., Michler, G., Piorkowska, E., Slouf, M., Vittorias, I., Wu, J.J. – PAC 92(9), 1503-1519 (2020), 17 pp.

*6 April 2019 – 20 March 2020; 11 months; 4 revisions.*

PAC-REP-19-04-08 *Structure, processing and performance of UHMWPE, Part 4: Sporadic fatigue crack propagation*, Bucknall, C., Altstädt, V., Auhl, D., Buckley, P., Dijkstra, D., Galeski, A., Gögelein, C., Handge, U.A., He, J., Liu, C.-Y., Michler, G., Piorkowska, E., Slouf, M., Vittorias, I., Wu, J.J. – PAC 92(9), 1521-1536 (2020), 16 pp.

*16 April 2019 – 20 March 2020; 11 months; 4 revisions.*

PAC-REP-2019-0502 *Global occurrence, chemical properties and ecological impacts of e-wastes (IUPAC Technical Report)*, Purchase, D., Abbasi, G., Bisschop, L., Chatterjee, D., Ekberg, C., Ermolin, M., Fedotov, P., Garelick, H., Isimekhai, K., Kandile, N., Lundström, M., Matharu, A., Miller, B., Pineda, A., Popoola, O., Retegan, T., Ruedel, H., Serpe, A., Shevah, Y., Surati, K., Walsh, F., Wilson, B., Wong, M. – PAC 92(11), 1733-1767 (2020), 35 pp.

*6 May 2019 – 5 February 2020; 6 months; 3 revisions.*

# GENERAL OVERVIEW

## of ICGCSD ACTIVITIES

The Interdivisional Committee on Green Chemistry for Sustainable Development, ICGSC was formally established only in January 2018. In the first two years ICGCCD was unable to work as it would have liked because its membership had been established so as not to burden the budget (TMs only from other Divisions); moreover, the Secretary was not very present for justified serious personal reasons.

ICGCCD supersedes the former Green Chemistry sub-committee, Division III (2005 - 2017).

ICGCSD has been in contact with OECD, UNEP, OPCW, PhosAgro, NHU and other institutions. It is necessary to understand how these government bodies operate.

In particular with OECD Pietro Tundo had institutional relations (Italian Government) for 20 and more years. In June 2018 he was invited to a working meeting in Paris. In that occasion he went with ICGCSD Secretary and spoke a lot about IUPAC, proposing institutional relationship.

UNEP accepted the invitation to participate in 13<sup>th</sup> **Postgraduate Summer School on Green Chemistry. In this respect**, Sandra Averous-Monnery, Programme Officer at the United Nations Environment Programme (UNEP) presented the UNEP's Green and Sustainable Chemistry Framework Manual that contains 10 green and sustainable chemistry objectives, addressed various facets of green and sustainable chemistry with the intention to foster general learning, reflection and scaling-up action. Together with ICGCSD, UNEP prepared a Survey for Green Chemistry Summer School participants. In the closing ceremony of the Summer School, Sandra Averous-Monnery highlighted the general information from the results of the Survey. This completed survey will aid UNEP in assessing the current green and sustainable chemistry landscape around the world.

In the case of OPCW research and collaboration relationships have been going on for a long time and will continue.

In particular PT invited many IUPAC affiliates, and representatives of international organizations as well, to attend green chemistry-related workshops in The Hague, in the last three years, organized by ICA-ICB Division.

The latest OPCW collaboration was the generous support given to the 13th Green Chemistry Summer School (4-10 July, 2021).

### Awards

- The NHU award is renewed and financed by the corresponding Chinese chemical industry with 20k\$. The objective of NHU award is to encourage young professional chemists and experienced chemists of the importance of advancements in Green Chemistry. The awards will be given during the Awarding Ceremony at IUPAC Congress in Montreal 2021. The 2021 awardees are Gabriele Laudadio from the Scripps Research Institute, Lichen Liu from

Tsinghua University, and Jingxiang Low from University of Science and Technology of China as the early career award winners, and David Milstein from the Weizmann Institute of Science, Israel for the experienced chemist award.

- The Chemrawn VII prize (5k\$) is given every two years during the International Conference on Green Chemistry. Huizhen Liu (China) and Banothile Makhubela (South Africa) have been awarded the 2020 IUPAC-CHEMRAWN VII for Green Chemistry in recognition of their outstanding contributions to the field of green chemistry. The Jury was composed by Pietro Tundo (Chair), Francesca Kerton (CHEMRAWN), and Aurelia Visa (ICGCSD). Official letters have to be sent to the winners.
- PhosAgro/UNESCO/IUPAC Green Chemistry Grants:  
<http://www.unesco.org/new/en/natural-sciences/science-technology/basic-sciences/chemistry/green-chemistry-for-life/>. The present 7<sup>th</sup> edition received 140 applications. Evaluation was already carried out by the international Jury. The formal announcement of the winners will be done by PhosAgro in due course.

#### **Activities/Conferences/Summer Schools**

-Flying Chemistry Educator Program (FCEP) in Ulang Bataar, Mongolia, 17-22 September 2019. The object of research was the creation of courses and training modules as well as the organization of research projects in the field of green chemistry. Aurelia Visa participate together with Anna Marakova, representing IUPAC-ICGCSD.

- UN Environment Program (UNEP) – organized last year (2019) meeting in Geneva and invited individual persons to collaborate in proposing some, so called, Manuals on green/sustainable chemistry.

**2018** - 8<sup>th</sup> Bangkok IUPAC Green Chemistry International Conference

**2018** - 11<sup>th</sup> Green Chemistry Post-Graduate Summer school Venice (ICGCSD Project)

**2019** - Symposium 8.5, Chemistry addressing the UN-17 sustainable development goals organized during 47<sup>th</sup> IUPAC Chemistry Congress, 8 July 2019, Paris, France

**2019** - 1<sup>st</sup> Green Chemistry Post graduate Summer school, Dar es Salaam (ICGCSD Project) - IUPAC FOR AFRICA - This School was ideated, promoted, organized by ICGCSD with considerable effort and time dedication. However, its outcomes were not as expected. Critical assessment would be necessary.

**2020** - 9<sup>th</sup> Athens IUPAC Green Chemistry International Conference (postponed to 2022 because the pandemic)

**2020** - First IUPAC Online Summer School Experience - 12<sup>th</sup> Postgraduate Summer School on Green Chemistry (IUPAC Endorsed with ICGCSD important involvement), 6<sup>th</sup>-10<sup>th</sup> July 2020

**2021- First IUPAC Online and Onsite Summer School Experience 13<sup>th</sup> Postgraduate Summer School on Green Chemistry** (IUPAC Endorsed with ICGCSD important involvement), 4<sup>th</sup>-10<sup>th</sup> July 2021.

**Publications on IUPAC Journals and Magazines** (incomplete list)

1. Natalia Tarasova, The 7th International IUPAC Conference on Green Chemistry, *Pure Appl. Chem.* 90(11): 1671–1672, **2018**; <https://doi.org/10.1515/pac-2018-0503>
2. Supawan Tantayanon, The 8th IUPAC International Conference on Green Chemistry, 9–14 September 2018 – Bangkok (Thailand), *Pure Appl. Chem.* 92(4): 543-544, **2020** <https://doi.org/10.1515/pac-2020-0303>
3. Jan Apotheker, Anna Marakova, Aurelia Visa, Flying Chemistry Educator Program in Ulang Bataar, Mongolia, *Chemistry International*, January-March, 37-41, **2020**
4. Aurelia Visa, Pietro Tundo, Fabio Arico, Green Chemistry Postgraduate Summer School Online, *Chemistry International*, January-March, 47-51, **2021**

**Projects**

1. Metrics for Green Syntheses [https://iupac.org/projects/project-details/?project\\_nr=2017-030-2-041](https://iupac.org/projects/project-details/?project_nr=2017-030-2-041) Tundo, who is the Chair of the related Task Group. This is a fundamental activity of IUPAC.
2. *Assessment of the contribution of IUPAC projects to the achievement of the United Nations Sustainable Development Goals* (IUPAC and UN17SDGS) - Project No.: 2020-011-2-041, Chair: Pietro Tundo
3. *Systems thinking in chemistry for sustainability: toward 2030 and beyond (STCS 2030+)* - Project No.: 2020-014-3-050, Chairs: Peter Mahaffy, Stephen Matlin, Marietjie Potgieter, Bipul Behari Saha, Aurelia Sorina Visa
4. *Summer School on Green Chemistry 2021*, Project no. 2021-014-1-041, Chair: Aurelia Visa
5. *Surveying the Green Chemistry Landscape from Research to Policy*, Project no. 2021-010-2-041, Chair: Jonathan Forman
6. *Green Chemistry in Sub-Saharan Africa*, Project No.: 2021-005-1-041, Chair: Liliana L. Mammino
7. *Personal Protective Equipment Disposal for the Future*, Project No.: 2021-012-2-400, Chair: Marloes Peeters, Michael Walter – ICGCSD is Partner of it
8. *Green and Sustainable Chemical Processes*, Project No.: 2021-001-2-041, Chair: Pietro Tundo (just approved).

# The Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD

## Highlights and/or Executive Summary

All the Core Members of the ICGCSD have had and have important institutional interactions with international organizations, either personally or through their academic affiliations. Furthermore, ICGCSD was only recently constituted and the first two years (2018-2019) were trial years. In practice it has only been working with full membership since January 2020.

Projects, Minutes, Activities, News, Outreach, and Newsletter of ICGCSD are reported on: <https://iupac.org/body/041>

ICGCSD compiles and operates according to IUPAC **MISSION** (fostering sustainable development), **CORE VALUES** (Scientific excellence and objectivity are the cornerstones of all our work. We value collaboration and communication among all our stakeholders.), **GOALS** provide scientific expertise to address critical world needs. Improve the vitality, effectiveness and efficiency of our Union and **OBJECTIVES** (Brand IUPAC in the minds of stakeholders):

- Improve quality and frequency of communication with stakeholders
- Expand and retain Member and volunteer base with an emphasis on diversity and inclusion
- Enhance interdivisional interaction and collaboration
- Emphasize multidisciplinary projects addressing critical global issues
- Support chemistry education, particularly in developing countries

**In doing that, ICGCSD carries on the UN 17 SDGs. Many foremost International Governmental Organizations deal with this aim and in particular with Green and Sustainable Chemistry. Most important are: UNESCO, OECD, UNEP, OPCW.**

Project no. 2020-011-2-041, *Assessment of the contribution of IUPAC projects to the achievement of the United Nations Sustainable Development Goals* will be a pivotal step at this regard.

Noteworthy, the APPENDIX 4 of the Report of the Review Group on the Organizational IUPAC Structure - Abstracts from Prof. Zhigang Shuai on Emerging Areas in the Chemical Sciences is reported that **"...novel efficient and green synthetic methods for important molecules and complex structures..."** is a growing direction for future front of Chemistry and as this effects the following points.

Particular attention was and will be devoted to Developing Countries, and in particular to Africa: connecting basic sciences, applications and outreach to sustainable development, capacity building of those Regions is promoted and developed and their connection with IUPAC is increased (Green Chemistry Summer School held in Dar es Salaam, May 12-19, 2019. Project [http://www.tcs-tz.org/iupac\\_summer\\_school\\_2019.htm](http://www.tcs-tz.org/iupac_summer_school_2019.htm)).

ICGCSD has established relationships (and in a few cases collaboration) with: UNESCO, OPCW, UNEP, OECD, ISC, TWAS, ACS/GCI, EuChemS, ISC<sub>3</sub> and with **Industry**: PhosAgro and NHU.

**Awards**; PhosAgro/UNESCO/IUPAC, IUPAC- Zhejiang/NHU, ChemRaw VII.

ICGCSD carries out many Projects (in course, submitted and to be submitted shortly). All of them are in collaboration with Divisions/Committees. Coordination activities on green and sustainable chemistry are conducted through its Division Representatives DRs. When Division Representatives propose a collaborative project, we rapidly discuss and eventually support the request with our budget.

## PLANS AND PRIORITIES FOR THIS BIENNIUM AND BEYOND

### ➤ **Current Projects:**

- Metrics for Green Syntheses- Project No.: 2017-030-2-041), Chair: Pietro Tundo  
[https://iupac.org/projects/project-details/?project\\_nr=2017-030-2-041](https://iupac.org/projects/project-details/?project_nr=2017-030-2-041)
- Systems thinking in chemistry for sustainability: toward 2030 and beyond (STCS 2030+)- Project No.: 2020-014-3-050, Chairs: Peter Mahaffy, Stephen Matlin, Marietjie Potgieter, Bipul Behari Saha, Aurelia Sorina Visa
- Assessment of the contribution of IUPAC projects to the achievement of the United Nations Sustainable Development Goals (IUPAC and UN17SDGs)- Project No.: 2020-011-2-041, Chair: Pietro Tundo
- Summer School on Green Chemistry 2021, Project no. 2021-014-1-041, Chair: Aurelia Visa
- Surveying the Green Chemistry Landscape from Research to Policy, Project no. 2021-010-2-041, Chair: Jonathan Forman
- Green and Sustainable Chemical Processes, Project No.: 2021-001-2-041, Chair: Pietro Tundo
- Green Chemistry in Sub-Saharan Africa, Project No.: 2021-005-1-041, Chair: Liliana L. Mammino
- Personal Protective Equipment Disposal for the Future, Project No.:2021-012-2-400, Chair: Marloes Peeters, Michael Walter – ICGCSD is Partner of it)

### ➤ **Project Proposals (To be submitted shortly)**

*Improving Safety Education Practice through Green Chemistry.* Chair: Jane Wissinger

When Division Representatives propose a collaborative project, ICGCSC rapidly discuss and eventually support the request with its budget. Proposals from Divisions through their Representatives should become much greater.

### ➤ **13<sup>th</sup> Summer School on Green Chemistry in Venice (July 4-10, 2021), endorsed by IUPAC**

[https://iupac.org/wp-content/uploads/2021/03/SS-2021\\_poster.pdf](https://iupac.org/wp-content/uploads/2021/03/SS-2021_poster.pdf)

In 2021 the Summer School on Green Chemistry was held in Venice, July 4-10, 2021 and also by remote for students who cannot attend for different reasons. In the school were participating 130 students from 39 countries. Daily report from the summer school can be found on IUPAC webpage: <https://iupac.org/brief-from-ssgc2021/>

**Next Summer School, the 14<sup>th</sup>, will be held on Venice in 3-8 July 2022.**

### ➤ **9<sup>th</sup> IUPAC Green Chemistry Int. Conference**

Due to pandemic situation the Congress in Athens could not be organized (October 18-22, 2020), therefore it will be held in 2022. The Organizing committee has already received about 200 abstracts from 50 countries. The website will be made ready on September-October 2021.

### **Collaborations with International Bodies**

UNEP: Preparation of Green and Sustainable Chemistry Manuals for Education and the related Survey.

OPCW: events in collaboration with ICA-ICB Division.

ISC3, Collaboration on Green and Sustainable Chemistry Manuals

UNESCO/TWAS, collaboration on the summer school

UNESCO/PhosAgro/IUPAC Partnership on Green Chemistry

**PhosAgro** Grants and **NHU** Awards will be continuously pursued.

ChemRawn VII on Green Chemistry Award (yr 2022) will be carried out (in collaboration with ChemRawn).

ICGCSD is looking forward for **National Representatives** in its Membership in order to establish links with NAOs: direct suggestions and proposals from the bottom are necessary in order to consider and then comply with the needs of them. The proposal was approved by the Bureau and will be in the Agenda of the Council for the final ratification.

#### **Montreal GA and WCC**

Together with Virtual meetings with Divisions and Committees (August 10<sup>th</sup>), ICGCSD will be involved in some symposia.

A special virtual event dealing with PhosAgro and NHU Awards will be carried out on 15<sup>th</sup> August 2021 (half a day Symposium). During such a Symposium the Project IUPAC and UN17SDGS Project No.: 2020-011-2-041 will have particular relevance (like that one held in Paris on July 8<sup>th</sup>, 2019).

## Overall report of ICGCSD activities and achievements during the later part of the 2018-2019 biennium and through 2020

See the Website <https://iupac.org/body/041>

### Relations and/or collaborations with:

OPCW, many meetings in The Hague.

OECD, Chemical Program on risk and hazard reduction. Regular Contacts

EuChemS Division on Green and Sustainable Chemistry. Regular Contacts

ACS/Green Chemistry Institute. Regular Contacts

ISC3, Germany. Many meetings in presence and by remote

UNESCO: IYPT, Paris, January 2019

UNESCO, Small States Developing Countries, SIDS. Cabo Verde Islands Meeting, July 2019

UNEP, December 2019, Genève, Switzerland

UNESCO/TWAS, Trieste, Italy

### Summer Schools

- **IUPAC Postgraduate Summer School on Green Chemistry 12-19 May 2019** – Dar es Salaam (Tanzania). [http://www.tcs-tz.org/iupac\\_summer\\_school\\_2019.htm](http://www.tcs-tz.org/iupac_summer_school_2019.htm)

The Summer School on Green Chemistry took place in Tanzania. This edition was the first IUPAC Summer School on Green Chemistry to be held in Africa; this was conceived, promoted and managed by IUPAC Interdivisional Committee on Green Chemistry for Sustainable Development (ICGCSD).

- **IUPAC endorsed Green Chemistry post Graduate Summer School 2020.**  
<https://www.unive.it/ssgc>

The Summer School on Green Chemistry was held in Venice from 5th to 10h July 2020 by Remote. [www.unive.it/ssgc](http://www.unive.it/ssgc) and <https://iupac.org/event/postgraduate-summer-school-on-green-chemistry/>.

This 12th edition of the Green Chemistry Summer Schools follows the 11 previous editions, of which the last one was held at Palazzo Ducale in Venezia, in July 2018.

The School was held in collaboration with IUPAC - Interdivisional Committee of Green Chemistry for Sustainable Development, ICGCSD, to which all the 15 members of the International Scientific Committee belonged, and Ca' Foscari University of Venice. The summer school was organized and managed by the Green Sciences for Sustainable Development Foundation, website [www.gssd-foundation.org](http://www.gssd-foundation.org).

In total, 210 applications arrived and 180 were considered eligible to attend the school after a strict selection made by the 15 members of the International Scientific Committee, and based on their CVs, their list of publications, the recommendation letters from their tutor and their motivations to attend the Summer School.

The 180 selected post-graduated attendees coming from 42 different countries and 30 teachers from all over the world participated in the Summer School online. We also had the pleasure and honour of hosting the Nobel Prize Jean-Marie LEHN, who gave his lecture before the Closing Ceremony.

- **13<sup>th</sup> Summer School on Green Chemistry in Venice (July 4-10, 2021), endorsed by IUPAC**  
[https://iupac.org/wp-content/uploads/2021/03/SS-2021\\_poster.pdf](https://iupac.org/wp-content/uploads/2021/03/SS-2021_poster.pdf)

In 2021 the Summer School on Green Chemistry was held in Venice, July 4-10, 2021 and also by remote for students who cannot attend for different reasons. The 130 selected post-graduated attendees (13 in person and 117 online participants) coming from 39 different countries and 34 teachers from all over the world participated in the Summer School online. Daily report from the summer school can be found on IUPAC webpage: <https://iupac.org/brief-from-ssgc2021/>

We also had the pleasure and honour of hosting the Nobel Prize Jean-Marie LEHN, who gave his lecture after the Opening Ceremony on 5<sup>th</sup> July 2021.

### ICGCSD prizes and awards (PhosAgro/UNESCO/IUPAC, NHU and Chemrawn VII) Awards

The *NHU award* is financed by the corresponding Chinese chemical industry. One experience award of 10k\$ and three young research awards of 2k\$ each. The objective of NHU award is to encourage young professional chemists and experienced chemists of the importance of advancements in Green Chemistry. IUPAC-Zhejiang NHU International Award. First time, Paris July 2019; next event, Montreal 2021.

The 2021 awardees are 2021 **Gabriele Laudadio** from the Scripps Research Institute, **Lichen Liu** from Tsinghua University, and **Jingxiang Low** from University of Science and Technology of China as the early career award winners, and **David Milstein** from the Weizmann Institute of Science, Israel for the experienced chemist award.

The aim of the *PhosAgro/UNESCO/IUPAC Partnership in Green Chemistry for Life* is to generate and apply new scientific knowledge in green chemistry through the promotion of the activity in this area of young scientists. 6 X 30k\$ research grants are granted each PhosAgro/UNESCO/IUPAC green chemistry Grants: these grants will be given in October-November 2021. Were received 140 applications for this call. The six winners will be announced by PhosAgro in due time.

The ChemRawn VII Green Chemistry prize (5k\$) is given every two years during the International Conference on Green Chemistry. The Prize of USD 5000 is granted to a young investigator (less than 45 years of age) from an emerging region who is actively contributing to research in Green Chemistry. Huizhen Liu (China) and Banothile Makhubela (South Africa) have been awarded the 2020 IUPAC-CHEMRAWN VII for Green Chemistry in recognition of their outstanding contributions to the field of green chemistry. The Jury was composed by Pietro Tundo (Chair), Francesca Kerton (CHEMRAWN), and Aurelia Visa (ICGCSD). Official letters have to be sent to the winners.

### Projects

- *Metrics for Green Syntheses*- Project No.: 2017-030-2-041), Chair: Pietro Tundo

Regarding the project Metrics for Green Syntheses [https://iupac.org/projects/project-details/?project\\_nr=2017-030-2-041](https://iupac.org/projects/project-details/?project_nr=2017-030-2-041), the project was completed and was sent for publication to PAC, there are 30 pages with mathematic formulas. It is necessary to proceed to the Project proposal Metrics No. 2 which will deal on Recommendations.

The Project was promoted and carried out by the IUPAC Interdivisional Committee on Green Chemistry for Sustainable Development, ICGCSD and, as Partners, by the Divisions of Physical and Biophysical Chemistry (Division I), Inorganic Chemistry (Division II), and Organic and Biomolecular Chemistry (Division III).

The aim of the Project is to evaluate by rigorous metrics the greenness of chemical synthesis proposed, which has not been covered so far.

The project is realized in two phases over time:

- I) The first phase involves the production of a Metrics, Glossary and Database list (MGS-1, this Technical Report)
- II) At a later stage, the second phase will involve the production of Guidelines. (MGS-2).

This first phase is composed of:

1. A List of metrics and related terms taken from papers published in the literature on the subject (formal definition for each term, literature and illustrated with some brief examples ).
2. A Glossary, that is, a comprehensive compilation of metrics that are currently used to gauge material, energy, and environmental impact metrics performances for individual reactions and synthesis plans.
3. Algorithm database list. All of them have their literature references cited.

This project will be published shortly in PAC as Technical Report.

- *Systems thinking in chemistry for sustainability: toward 2030 and beyond (STCS 2030+)*- Project No.: 2020-014-3-050, Chairs: Peter Mahaffy, Stephen Matlin, Marietjie Potgieter, Bipul Behari Saha, Aurelia Sorina Visa

At this moment the members are divided into two working groups (WG) one on Sustainability and one on Education. Every two weeks WG1-Sustainability composed by Peter Mahaffy, Stephen Matlin, Aurelia Sorina Visa, Jane Wissinger, Klaus Kümmerer, Sarah Cornell and Bipul Behari Saha, organized group meetings discussing the next steps in project development.

An editorial was submitted to J. Chem. Educ, entitled: *Integrating Sustainability into Learning in Chemistry*, on April Issue dedicated to Earth Day 2021.

- *Assessment of the contribution of IUPAC projects to the achievement of the United Nations Sustainable Development Goals (IUPAC and UN17SDGs)*- Project No.: 2020-011-2-041, Chair: Pietro Tundo

[https://iupac.org/projects/project-details/?project\\_nr=2020-011-2-041](https://iupac.org/projects/project-details/?project_nr=2020-011-2-041)

Partners: Committee on Chemistry Education and Committee on Chemistry and Industry

The Project will be executed according to the following tasks:

Task 1: Survey of all IUPAC Projects and categorize them according to the SDGs

Task 2: Project Meeting at the International Summer School on Green Chemistry in Venice, Italy, July 5-10, 2020 (online).

Task 3: Classification of IUPAC Projects according to IUPAC Committees and Divisions

Task 4: Identification of a synergy between IUPAC Projects

Task 5: Project Meeting at the European Chemical Society Conference, 2021, Thessaloniki, Greece, National Meeting of the American Chemical Society, and Green Chemistry Institute of the American Chemical Society

Task 6: Development of project materials for open-access online database within the IUPAC.org platform to demonstrate the contribution of IUPAC Projects to the achievement of SDGs.

Task 7: Project Meeting at the 48th IUPAC World Chemistry Congress, Montreal, Canada, August 13-20, 2021

Task 8: Preparation of Report and Recommendations for Future Strategic Plans of IUPAC to achieve SDGs European Chemical Society Conference

- *Summer School on Green Chemistry 2021*, Project no. 2021-014-1-041, Chair: Aurelia Visa

The School was held in collaboration with IUPAC - Interdivisional Committee of Green Chemistry for Sustainable Development, ICGCSD, to which all the 15 members of the International Scientific Committee belonged, and Ca' Foscari University of Venice. The summer school was organized and managed by the Green Sciences for Sustainable Development Foundation, website [www.gssd-foundation.org](http://www.gssd-foundation.org). In 2021 the Summer School on Green Chemistry was held in Venice, July 4-10, 2021 and also by remote for students who cannot attend for different reasons. In the school were participating 130 students from 39 countries. Daily report from the summer school can be found on IUPAC webpage: <https://iupac.org/brief-from-ssgc2021/>

ICGCSD contributes with 2,800 € supporting the participation of four PhD students from Developing Countries.

- Surveying the Green Chemistry Landscape from Research to Policy, Project no. 2021-010-2-041, Chair: Jonathan Forman
  - Green Chemistry in Sub-Saharan Africa, Project No.: 2021-005-1-041, Chair: Liliana L. Mammino
  - Personal Protective Equipment Disposal for the Future, Project No.: 2021-012-2-400, Chair: Marloes Peeters, Michael Walter –ICGCSD is Partner
  - Green and Sustainable Chemical Processes, Project No.: 2021-001-2-041, Chair: Pietro Tundo (just approved).
- 
- Collaborations with Divisions is just started: proposals from Divisions through their Representatives should become much more.
  - Proposals from NAOs (through their National representatives) will be welcome.

**Publications on PAC and CI: see Tabular Material.**

## TABULAR MATERIAL

**2018 - 8<sup>th</sup> Bangkok IUPAC Green Chemistry International Conference – PAC Special Issue)**

**2018 - 11<sup>th</sup> Green Chemistry Post-Graduate Summer school Venice (ICGCSD Project)**

**2019 - Symposium 8.5, Chemistry addressing the UN-17 Sustainable Development Goals** organized during 47<sup>th</sup> IUPAC Chemistry Congress, 8 July 2019, Paris, France

**2019 - 1<sup>st</sup> Green Chemistry Post graduate Summer School, Dar es Salaam (ICGCSD Project) - IUPAC FOR AFRICA** - This School was ideated, promoted, organized by ICGCSD with considerable effort and time dedication. However, its outcomes were not as expected. Critical assessment would be necessary.

**2020 - First IUPAC Online Summer School Experience - 12<sup>th</sup> Postgraduate Summer School on Green Chemistry** (IUPAC Endorsed with ICGCSD important involvement), 6<sup>th</sup>-10<sup>th</sup> July 2020

**2021- First Online and Onsite Summer School Experience 13<sup>th</sup> Postgraduate Summer School on Green Chemistry** (IUPAC Endorsed with ICGCSD important involvement), 4<sup>th</sup>-10<sup>th</sup> July 2021; <https://www.greenchemistry.school/>;

**2020 - 9<sup>th</sup> Athens, IUPAC Green Chemistry International Conference** (postponed to 2022 because the pandemic).

### Projects

1. Metrics for Green Syntheses [https://iupac.org/projects/project-details/?project\\_nr=2017-030-2-041](https://iupac.org/projects/project-details/?project_nr=2017-030-2-041) Tundo, who is the Chair of the related Task Group. This is a fundamental activity of IUPAC.
2. *Assessment of the contribution of IUPAC projects to the achievement of the United Nations Sustainable Development Goals* (IUPAC and UN17SDGS) - Project No.: 2020-011-2-041, Chair: Pietro Tundo
3. *Systems thinking in chemistry for sustainability: toward 2030 and beyond (STCS 2030+)* - Project No.: 2020-014-3-050, Chairs: Peter Mahaffy, Stephen Matlin, Marietjie Potgieter, Bipul Behari Saha, Aurelia Sorina Visa
4. *IUPAC for Africa: Postgraduate Summer School on Green Chemistry*, Project no. 2018-017-1-041, Chair: Charles Kihampa
5. *Postgraduate Summer School on Green Chemistry*, Project no. 2017-006-2-041, Chair: Pietro Tundo
6. *Summer School on Green Chemistry 2021*, Project no. 2021-014-1-041, Chair: Aurelia Visa
7. *Surveying the Green Chemistry Landscape from Research to Policy*, Project no. 2021-010-2-041, Chair: Jonathan Forman
8. *Personal Protective Equipment Disposal for the Future*, Project No.:2021-012-2-400, Chair: Marloes Peeters, Michael Walter (ICGCSD is Partner of it).

9. *Green and Sustainable Chemical Processes*, Project No.: 2021-001-2-041, Chair: Pietro Tundo (just approved)

## **Publications** (only a few are here reported)

1. Natalia Tarasova, The 7<sup>th</sup> International IUPAC Conference on Green Chemistry, *Pure Appl. Chem.* 90(11): 1671–1672, **2018**; <https://doi.org/10.1515/pac-2018-0503>
2. Pietro Tundo, Elena Guriol, Green Chemistry for Sustainable Development, *Chemistry International*, January-March, 17-24, **2018**
3. Pietro Tundo, Janet L. Scott, Buxing Han, The 6<sup>th</sup> International IUPAC Conference on Green Chemistry 4–8 September 2016 – Venezia (Italy), *Pure Appl. Chem.* 90(2): 235-237, **2018**; DOI: <https://doi.org/10.1515/pac-2017-1201>
4. Pietro Tundo, IUPAC Postgraduate Summer School on Green Chemistry, *Chemistry International*, October-December, 38-41, **2018**
5. Supawan Tantayanon, The 8<sup>th</sup> IUPAC International Conference on Green Chemistry, 9–14 September 2018 – Bangkok (Thailand), *Pure Appl. Chem.* 92(4): 543-544, **2020** <https://doi.org/10.1515/pac-2020-0303>
6. Jan Apotheker, Anna Marakova, Aurelia Visa, Flying Chemistry Educator Program in Ulan Bataar, Mongolia, *Chemistry International*, January-March, 37-41, **2020**
7. Aurelia Visa, Pietro Tundo, Fabio Arico, Green Chemistry Postgraduate Summer School Online, *Chemistry International*, January-March, 47-51, **2021**



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19.7 Project Committee Report to Council

Prof. Jan Reedijk

**Project Committee (PC) 2020-2021(July)**

**Summary of financial activity, Jan. 2020 - March 2021**

This summary covers the financial activity of the PC for the period Jan. 1, 2020 – July, 2021. Details of the applications (applicants names, project titles, amounts requested and awarded, etc.) are presented below. All monetary values are in USD.

**Projects**

The PC's budget for projects for 2020-2021 was budgeted as \$ 90,000; the budget for FSC projects is \$ 20,000.

The Committee completed the reviewing and decided for granting for 7 project applications in the reporting period, including one FSC application.

**The projects with a funding decision are:**

1. Development of a Standard for FAIR Data Management of Spectroscopic Data; project number 2019-031-1-024 (Hanson); amount up to: \$ 5000
2. Gold Book Update for Polymers project number: 2019-043-2-400 (Dos Santos); amount up to: \$ 4000
3. Guidelines on developing robust biocatalysts for biorefinery: 2019-046-3-300 (Bai); amount up to: \$ 4000
4. FSC-SER APCE & CECE 2020 Conference - Joint Meeting of the 18th Asia Pacific Symposium on Microscale Separation and Analysis and 17th International Interdisciplinary Meeting on Bioanalysis: 2020-003 (Cambodja); amount :\$ 4000
5. Systems Thinking in Chemistry for Sustainability: Toward 2030 and Beyond (STCS 2030+): project 2020-014-3-050 (Mahaffy); amount up to: \$ 2720
6. STP-LA3: IUPAC COCI Safety Training Program - Latin America, STP Associate Fellows Training (third edition): 2020-015-1-022 (Benzo); amount up to: \$ 4000.



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The number of newly submitted applications during 2020 was 25 in total; during 2018 and 2019 together this number was 88, i.e. 44 on average per year. This apparent decrease in 2020 is likely related to the pandemic and as a result other priorities of potential applicant teams/task groups. Two recently submitted project proposals from ICGCSD are under review.

## Evaluation Committee Report – Biennium 2020-2021

Composition: Standing Committee Chair: Javier García-Martínez, Standing Committee Secretary: Lynn Soby, Members: Jan Apotheker, Mary J. Garson, Ehud Keinan and Christine Luscombe

### Executive Summary:

The biennium after IUPAC celebrated its first centenary has been quite different. Since early 2020, we all had to adapt to work during a pandemic, which has greatly limited our ability to travel and meet in person and required significant changes to work remotely, quite often at inconvenient times and long hours. Thanks to the efforts and commitment of all our volunteers and staff, we have been able not only to continue the operations, projects, and activities of IUPAC but also embark on one of the major organizational structure changes in the history of the Union, as mandated by the Council during the 2019 General Assembly in Paris.

The Evaluation Committee has assessed how these changes impact the normal business of the Union, for example in terms of the number of project proposal submitted. We realized that this number had dropped quite significantly, although the reasons for this are still unclear.

To better understand what our stakeholders need from us, we conducted a survey with the main conclusions summarized in this report. They have helped us produce a set of recommendations, which we included at the end of this report, in light of the profound changes we are experimenting due to more remote working and the changes proposed by the Review Group.

We hope that this document will be useful in a time of rapid and significant changes and new opportunities, as our online activities, including the Global Women Breakfast, the Periodic Table Challenge, the Top Ten Emerging Technologies in Chemistry, and ChemVoices, among others, clearly show.

### IUPAC projects system

*Question: How is the IUPAC project system currently performing?*

Answering this question required an analysis of current project facts and figures; how many projects currently? How many have been unproductive or are overdue? What is the diversity in task group membership? Are projects inclusive? Do they address high priority and important topics within the chemical sciences? Do they achieve their goals? What are the long-term benefits of the project system in the current form to IUPAC? Are the funds that IUPAC commits to projects well spent?

#### *Background*

Various Bureau minutes (1997 onwards) supplemented by the book *History of IUPAC 1988-1999* by S. S. Brown explain the change across to the project system from the earlier commission system. The project system was gradually implemented during the 2000-2001 biennium with the termination of the majority of commissions at the end of 2001. Many Commission chairs were incorporated into task groups to enable a smooth transition of key work to the project system. Some Commissions operating jointly with other Unions were necessarily maintained, and the 1999 Council meeting also issued a statement assuring continuity of core activities (e.g., atomic weights, symbols, nomenclature).

According to Bureau minutes, recent reviews of the project system took place in 2009 (Weir) and 2013 (Powell – Project Committee; see also Evaluation Committee report by Penczek).

The 2020-2021 budget (approved by Council, July 2019) records “project” allocations of \$266,931 to Divisions, \$64,500 to Standing Committees, and \$90,000 to the Project Committee.

### *Analysis*

An initial analysis of projects was based on the December 2019 and August 2020 financial records, the Excel spreadsheet of the database held at the Secretariat, and the project listings via the Project tab on the website. A follow-up analysis used data available up to April 2021.

### *Project Statistics*

There were 176 projects listed in the August 2020 financial records, of which 35 were recorded as “overdue”. At that time, the Divisions and Standing/Executive Committees led 149 and 27 projects, respectively. Two Divisions ran a smaller number of projects than the other Divisions, but this was not necessarily an indication of decreased activity. Follow-up inspection of the March 2021 financial records lists a total of 174 current projects (Divisions 146: Standing/Executive Committees 28), of which 24 were recorded as “overdue”.

Project records taken from the IUPAC website indicate 22 completed projects between 1 January-31 August 2020. A further 14 projects were completed between August 2020 and April 2021, leading to a total of 36 completed projects so far this biennium.

Before October 2020, only 18 proposals had been submitted into the project system. However, by April 2021, there were 36 project proposals submitted in the biennia (with 6 proposals currently under review). These submissions led to a total of 27 new projects initiated by April 2021. The project proposal numbers contrast to previous years when the numbers of project submissions have generally been higher. Between 2002-2011, an average of 112 projects were submitted each biennium, with a larger fraction of the submissions in the second year of the biennium. From 2012-2019, an average of 97 projects were submitted each biennium.

The decline in project numbers is not necessarily a bad outcome; some Divisions (I, for example) prefer to run a smaller number of larger projects, while other Divisions (V, for example) prefer to divide larger project tasks into smaller projects. So, Division I has a single project updating the Green Book, while Division V has a set of projects, each looking at updating an individual chapter of the Orange Book. There is no uniform “one size fits all” approach to project organization.

The small number of new project proposals submitted so far this biennium reflects three aspects of COVID over which IUPAC has no control; (i) volunteers have been tied up, with online teaching/admin/research taking up a lot more of their available time; (ii) many project proposal emerge from face-to-face interactions at conferences and meetings; the synergy and creative interactions are missing from Zoom interactions; (iii) everyone is distracted. Note that some Divisions are using this COVID time to complete existing projects rather than submit new ones.

### *Project Outputs*

IUPAC projects fall into two main categories – representing (i) core scientific work of IUPAC; (ii) outreach/networking activities, respectively. Core scientific projects generally produce technical reports/recommendations published in *Pure Appl. Chem.*, and in certain cases online repositories of data, whereas outreach/networking projects involve meetings/webinars/websites and other written material of a general nature.

Written outputs from 22 projects completed between January 2020 and August 2020 included two books, 16 articles in *Pure Appl. Chem.*, 11 follow-up articles in *Chem. Int.* (in addition to earlier project announcements), and two other journal articles. Meetings included two workshops and a

summer school, six meetings linked to the gender gap project, and the meeting/event activity linked to the world Chemistry Congress/General Assembly in Paris 2019 celebrating IUPAC100. Two projects completed substantial website repositories of data, three projects set up websites, and one completed a YouTube video. At least five task groups reported a continuation of their project activity beyond 2020. Follow-up analysis of outputs from 14 projects shown as completed since August 2020 included 8 articles in *Pure Appl Chem* and >10 articles in other chemical literature. Three of the 14 projects were “outreach” rather than scientific, including the high-profile IYPT project.

For comparison, written outputs from the 71 projects completed during the 2018-2019 biennium included 5 books, 26 articles in *Pure Appl. Chem.*, 22 follow-up articles in *Chem. Int.* (in addition to earlier project announcements), and ~50 other journal articles or book chapters. Meetings include 16 workshops, 7 symposia, a summer school, plus in-service/training events run by COCI. Eleven projects completed substantial website repositories of data or set up websites, and two of these project activities were further captured as IUPAC100 Stories on the IUPAC100 website. Less than ten projects recorded limited or nil activity on their IUPAC project website page, and 12 projects (17% of total completions) were terminated.

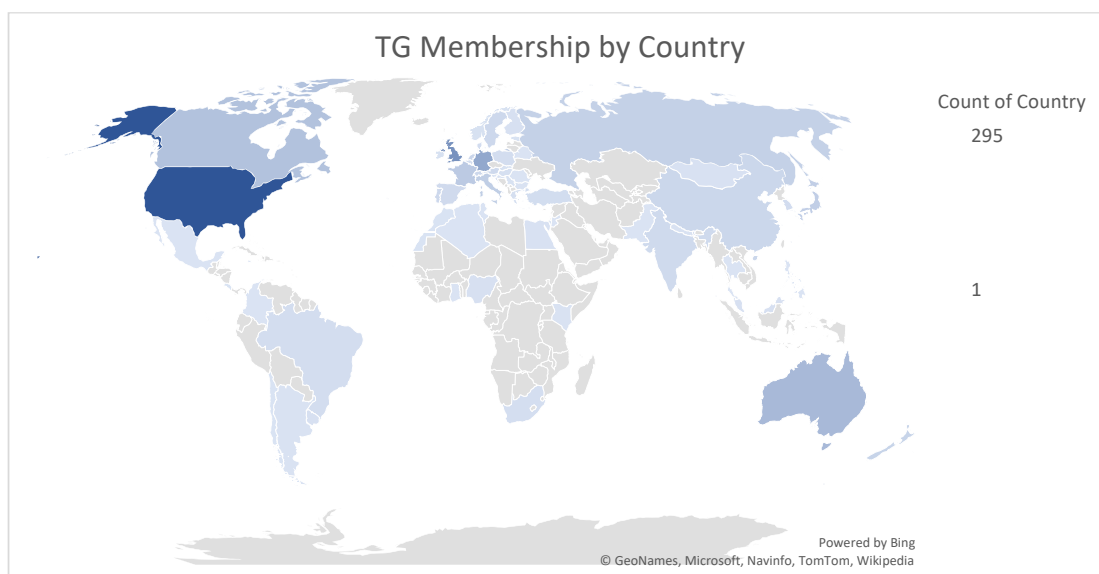
#### *Project Evaluation by Divisions/Standing Committees*

There are marked differences in the approach of individual Divisions and Standing Committees to review project proposals, ongoing project evaluation, and assessment of completed projects. For example, some, but not all, Divisions have a dedicated Project Coordinator. There are also differences in the approach of individual Divisions to the evaluation of project outcomes.

Note that two Standing Committees (CHEMRAWN, ICGCSD) do not have direct access to project funds. ICGCSD currently has the approval to use its Operations budget for project purposes.

#### *Diversity and Inclusiveness<sup>a,b</sup>*

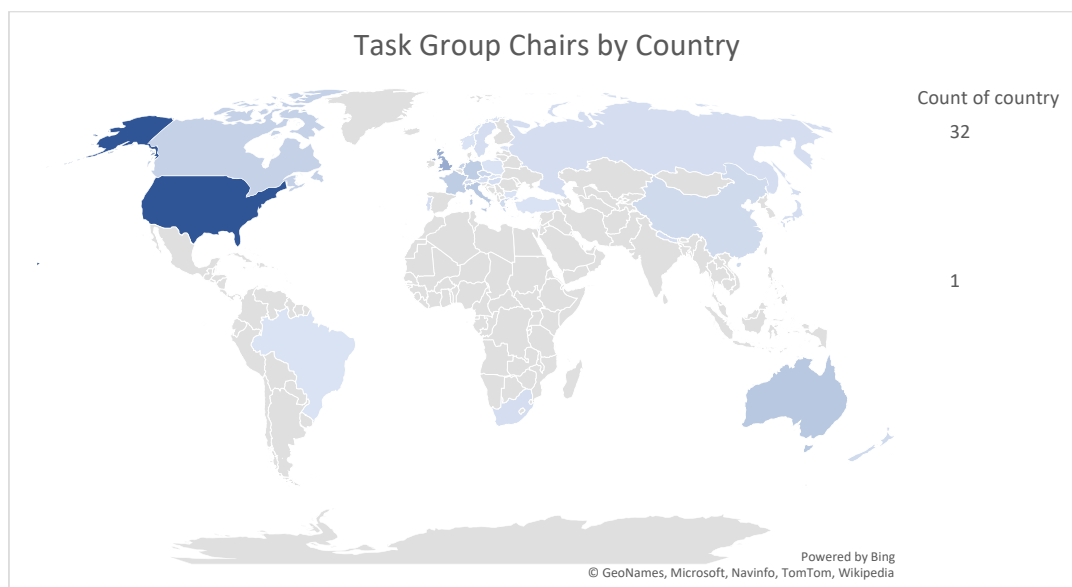
The list of 1411 volunteers (recorded in an Excel spreadsheet downloaded from the IUPAC database) shows considerable geographic diversity, with significant participation from North American and European countries. A total of 63 countries contribute task group members.



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<sup>a</sup> TG chair data taken from August 2020 financial records; TG membership data are taken from Excel spreadsheet downloaded from the master database. <sup>b</sup> Note some individuals are on multiple projects, and the task group chairs are often running more than one project.

Task group chairs represent 29 different countries. Thirteen countries provide three or more TG chairs, with two countries (USA and UK) providing 32 and 13 TG chairs, respectively. Among the projects run by Standing Committees, all CPCDS projects are (owing to the nature of the work?) led by representatives from the USA. CCE projects strongly reflect the diversity and broad geographic representation of CCE members. Three of the eight Divisions have more than ten countries represented in TG leadership.



The majority of projects involve female participants, however, task group leadership by women currently sits at <20%.

It appears that few projects other than those explicitly involving the IYCN have young chemist members.

### Recommendations of the Evaluation Committee – Biennium 2020-2021

1. When first introduced, the project system was intended to be managed by the Divisions/Standing Committees. Therefore, all Divisions and Standing Committees should ensure that they appoint a project coordinator (DC or SCC) from their TM list. This individual would coordinate the review of submitted project proposals within their Division, monitor the progress of projects, and coordinate evaluation by the Division of project progress. They would also provide updates and information to the Associate Director for inclusion on the project webpage. Some Divisions and Standing Committees may prefer to appoint a Project Coordination team to share the workload among several Titular Members.

Note: several Divisions and Standing Committees already have a dedicated individual with responsibility for projects. This recommendation is therefore presented because some IUPAC bodies lack an identified structure for their project management. It is important that a project coordinator is a current member of the Division or Standing Committee, and that they have sufficient eligibility remaining after appointment to continue as a Divisional or Standing Committee member.

2. Task groups should be strongly encouraged to involve Young Chemists among their project team. A good resource to engage young chemists is through the International Young Chemists Network (IYCN), which is an Associate Organization of IUPAC.
3. Quality ('high impact') project proposals from interdivisional or joint Divisional-Standing Committee task groups should be strongly encouraged.
4. Overall, the project system represents excellent use of IUPAC's limited funds. Task Group chairs should be congratulated for their work on the many and diverse range of funded projects. Working collectively and together with members of the Project Committee, the Divisions and Standing Committees should ensure that there is no duplication of the project(s) by consolidating projects with overlapping or competing aims.
5. Several projects progress very slowly, and, over time, the Task Group loses enthusiasm for the project activity. Projects that are identified as insufficiently high impact, or which do not progress in a timely fashion, should be recommended for termination by the responsible Division or Standing Committee on a regular basis.

Note that the formal responsibility for project termination lies with the Secretary-General.

6. The project proposal submission form should be moved to an online format. This opportunity may be used to adapt the form to simplify it and to provide clear guidance, not only on how to fill it out but also to provide some recommendations (encourage the participation of different IUPAC bodies, seeking funding outside IUPAC, integrating the output within the IUPAC digital effort...)
7. The guidelines of the project proposal submission form should clarify that some funds may be used to disseminate the output of the projects, more especially to cover some online tools or platform fees.



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**Membership - Division (I)**  
***Physical and Biophysical Chemistry***  
**2022-2023**

Name	Status	Term	NAO
Dr. Pierangelo Metrangolo	TM- President	2022-2023	Italy
Dr. Tim Wallington	TM- Past-President	2022-2023	United States
Prof. Frances Separovic	TM-Vice President	2022-2023	Australia
Prof. Joaquim Faria	TM	2022-2023	Portugal
Prof. Modou Fall	TM	2022-2023	Senegal
Prof. Zhigang Shuai	TM	2022-2023	China
Prof. Ilja Karina Voets	TM	2022-2023	Netherlands
Prof. Angela Wilson	TM	2020-2023	United States
Prof. Malgorzata Witko	TM	2022-2023	Poland
Prof. Luis Montero Cabrera*	AM	2022-2023	Cuba
Prof. Kwok Feng Chong	AM	2022-2023	Malaysia
Prof. Terry Frankombe	AM	2022-2023	Australia
Prof. Igor Schapiro	AM	2022-2023	Israel
Prof. Hiroko Tokoro	AM	2022-2023	Japan
Prof Vessela Tsakova	AM	2020-2023	Bulgaria
Prof. Jeremy G. Frey	NR	2022-2023	United Kingdom
Prof. Theo C. Kurten	NR	2022-2023	Finland
Dr. Lynda Ngozi-Olehi	NR	2020-2023	Nigeria
Prof. Vudthichai Parasuk	NR	2022-2023	Thailand
Prof. Miroslav Štěpánek	NR	2022-2023	Czech Republic
	10 TM's, 6 AM's, 5 NR's		

*\*Paid Affiliate Member 2021*

*For Council*



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**Membership - Division (I)**  
**Physical and Biophysical Chemistry**  
***Commission on Physicochemical Symbols, Terminology, and Units (I.1)***  
**2022 – 2023**

Name	Status	Term	NAO
Prof. Yutaka Kuroda*	TM – Chair	2022-2023	Japan
Prof. Roberto Marquardt*	TM – Secretary	2022-2023	France
Prof. Jan Kaiser	TM	2022-2023	Germany
Prof. A. James McQuillan-2 <sup>nd</sup> term	TM	2022-2023	New Zealand
Prof. Stuart Chalk	AM	2022-2023	United States
Prof. Geng Deng	AM	2022-2023	China/Beijing
Prof. Martin Quack*	NR	2022-2023	Switzerland

*\*Executive Committee Approved Exceptions 01 July 2021*

*For Council*



INTERNATIONAL UNION OF  
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**Membership - Division (II)**  
***Inorganic Chemistry***  
**2022 - 2023**

Name	Status	Term	NAO
Prof. Lidia Armelao	TM- President	2022-2025	Italy
Prof. Lars R. Ohrström	TM- Past President	2022-2023	Sweden
Dr. Daniel Rabinovich	TM- Secretary	2020-2023	United States
Prof. Elisabeth Bouwman	TM	2022-2023	Netherlands
Dr. Jorge Colon	TM	2020-2023	Puerto Rico
Prof. Maria Concepcion Gimeno	TM	2022-2023	Spain
Prof. Mi Hee Lim	TM	2022-2023	South Korea
Prof. Philippe Knauth	TM	2020-2023	France
Dr. Juris Meija	TM	2020-2023	Canada
Prof. Thomas Walczyk	TM	2022-2023	Singapore
Prof. Yang Farina Absuk Aziz	AM	2022-2023	Malaysia
Prof. Mayoro Diop	AM	2022-2023	Senegal
Prof. Robin Macaluso	AM	2022-2023	United States
Prof. Ken Sakai	AM	2022-2023	Japan
Dr. Alessandra Sanson	AM	2022-2023	Italy
Prof. Xiangkun Zhu	AM	2022-2023	China/Beijing
Prof. Murad Aldamen	NR	2022-2023	Jordan
Prof. Haim Cohen	NR	2022-2023	Israel
Prof. Phimphaka Harding	NR	2022-2023	Thailand
Prof. Miki Hasegawa	NR	2022-2023	Japan
Dr. Rosalie Hocking	NR	2022-2023	Australia
Prof. Pavel Karen	NR	2022-2023	Norway
Dr. Lukas Krivosudsky	NR	2022-2023	Slovakia
Dr. Andrew Logsdail	NR	2022-2023	United Kingdom
Prof. Onder Metin	NR	2022-2023	Turkey
Dr. Nnaemeka Ngobiri	NR	2022-2023	Nigeria

*For Council*



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**Membership - Division (III)**  
***Organic and Biomolecular Chemistry***  
**2022 - 2023**

Name	Status	Term	NAO
Prof. Amelia Rauter	TM-President	2022-2023	Portugal
Prof. Nikolay Nifantiev	TM- Past President	2022-2023	Russia
Prof. Einar Uggerud	TM- Vice President	2022-2023	Norway
Prof. Slawomir Jarosz	TM- Secretary	2020-2023	Poland
Prof. Jason Harper	TM	2020-2023	Australia
Prof. Ari Koskinen	TM	2022-2023	Finland
Prof. Cristina Nativi	TM	2022-2023	Italy
Prof. Paolo Scrimin	TM	2022-2023	Italy
Prof. Zbigniew Witczak	TM	2022-2023	United States
Prof. Makoto Yamashita	TM	2022-2023	Japan
Prof. Axel Griesbeck	AM	2022-2023	Germany
Prof. Mohamed Hegazy	AM	2022-2023	Egypt
Prof. John Honek	AM	2022-2023	Canada
Prof. Priyani Paranagama	AM	2022-2023	Sri Lanka
Prof. Ian Williams	AM	2022-2023	United Kingdom
Prof. Zhen Xi	AM	2022-2023	China/Beijing
Dr. Claudia Bonfio	NR	2022-2023	United Kingdom
Dr. Morgan Donnard	NR	2020-2023	France
Prof. Eun Joo Kang	NR	2022-2023	South Korea
Prof. Palangpon Kongsaree	NR	2020-2023	Thailand
Prof. Mindy Levine	NR	2022-2023	Israel
Prof. Emilia Naydenova	NR	2020-2023	Bulgaria
Prof. Romano V.A. Orru	NR	2020-2023	Netherlands
Prof. Vinod K. Singh	NR	2022-2023	India
Prof. Shih-Sheng Sun	NR	2022-2023	China/Taipei
Dr. Zuriati Zakaria	NR	2022-2023	Malaysia
	10 TM's, 6 AM's, 10 NR's		

*For Council*



INTERNATIONAL UNION OF  
PURE AND APPLIED CHEMISTRY

**Membership - Division (IV)**  
***Polymer***  
**2022 - 2023**

<b>Name</b>	<b>Status</b>	<b>Term</b>	<b>NAO</b>
Prof. Christine Luscombe	TM-President	2020-2023	United States
Dr. Igor Lacik	TM-Vice President	2020-2023	Slovakia
Prof. Paul Topham	TM-Secretary	2020-2023	United Kingdom
Prof. Chin-Han Chen	TM	2020-2023	Malaysia
Prof. Tanja Junkers	TM	2022-2023	Australia
Prof. Peter Mallon	TM	2022-2023	South Africa
Prof. Youngfen Men	TM	2022-2023	China/Beijing
Prof. John Matson	TM	2022-2023	United States
Dr. Marloes Peeters	TM	2022-2023	United Kingdom
Prof. Patrick Théato	TM	2022-2023	Germany
Prof. Ana Isabel Aguiar-Ricardo	AM	2022-2023	Portugal
Dr. Christopher Fellows	AM	2022-2023	Australia
Dr. Danniebelle Haase	AM	2022-2023	United States
Prof. Robin Hutchinson	AM	2022-2023	Canada
Prof. Jan Merna	AM	2022-2023	Czech Republic
Prof. Myung-Han Yoon	AM	2022-2023	South Korea
Prof. Rameshwar Adhikari	NR	2022-2023	Nepal
Prof. Jiun-Tai Chen	NR	2022-2023	Taipei
Dr. Sophie Guillaume	NR	2022-2023	France
Dr. Joseph Imanah	NR	2022-2023	Nigeria
Prof. Akihiro Kishimura	NR	2022-2023	Japan
Dr. Guy Mechrez	NR	2022-2023	Israel
Prof. S. Ramakrishnan	NR	2022-2023	India
Prof. Guido Raos	NR	2020-2023	Italy
Prof. Mehmet Tasdelen	NR	2022-2023	Turkey
Prof. Jan C. van Hest	NR	2022-2023	Netherlands
	<i>exOfficio</i>		
	10 TMs, 6 AMs, 10 NRs		

*For Council*



INTERNATIONAL UNION OF  
PURE AND APPLIED CHEMISTRY

**Membership - Division (V)**  
***Analytical Chemistry***  
**2022 - 2023**

<b>Name</b>	<b>Status</b>	<b>Term</b>	<b>NAO</b>
Prof. David Shaw	TM-President	2022-2023	United States
Dr. Zoltan Mester	TM-Past President	2022-2023	Canada
Dr. Derek Craston	TM-Vice President	2022-2023	United Kingdom
Prof. Luisa Torsi	TM-Secretary	2022-2023	Italy
Prof. Reşat Apak	TM	2022-2023	Turkey
Prof. Vasilisa Baranovskaia	TM	2020-2023	Russia
Prof. Jiri Barek	TM	2022-2023	Czech Republic
Dr. Ilya Kuselman	TM	2022-2023	Israel
Prof. Takae Takeuchi	TM	2020-2023	Japan
Dr. Susanne Wiedmer	TM	2020-2023	Finland
Dr. Franziska Emmerling	AM	2002-2023	Germany
Prof. Erico Flores*	AM	2020-2023	Brazil
Prof. Ivo Leito	AM	2022-2023	Estonia
Prof. Hongmei Li	AM	2020-2023	China/Beijing
Dr. Aura Tintaru	AM	2022-2023	France
Prof. Earle Waghorne	AM	2022-2023	Ireland
Dr. Raychelle Burks	NR	2022-2023	United States
Prof. Hye Ryung Byon	NR	2022-2023	South Korea
Prof. Orawon Chailapakul	NR	2022-2023	Thailand
Prof. Jan Labuda	NR	2022-2023	Slovakia
Prof. Charles Lucy	NR	2022-2023	Canada
Prof. Clara F. Magalhães	NR	2022-2023	Portugal
Prof. Thalappil Pradeep	NR	2022-2023	India
Dr. Malarvili Ramalingam	NR	2022-2023	Malaysia
Prof. Rufus Sha'Ato	NR	2020-2023	Nigeria
Ms. Danny Van Oevelen	NR	2022-2023	Netherlands
	10 TMs, 6 AMs, 10 NRs		

*\*2021 Paid AMP*

*For Council*



INTERNATIONAL UNION OF  
PURE AND APPLIED CHEMISTRY

**Membership - Division (VI)**  
***Chemistry and the Environment***  
**2022 - 2023**

Name	Status	Term	NAO
Prof. Roberto Terzano	TM-President	2022-2023	Italy
Prof. Hemda Garelick	TM-Past President	2022-2023	United Kingdom
Prof. Annemieke Farenhorst	TM-Vice President	2022-2023	Canada
Prof. Fani Sakellariadou	TM-Secretary	2020-2023	Greece
Dr. Wenlin Chen	TM	2022-2023	United States
Dr. Rai Kookana	TM	2022-2023	Australia
Dr. Bradley Miller	TM	2020-2023	United States
Prof. Diane Purchase	TM	2020-2023	United Kingdom
Prof. Irina Perminova	TM	2022-2023	Russia
Prof. Weiguo Song	TM	2020-2023	China/Beijing
Prof. Cristina Delerue-Matos	AM	2022-2023	Portugal
Dr. Matteo Guidotti	AM	2022-2023	Italy
Dr. Bipul Behari Saha	AM	2020-2023	India
Dr. Walter Waldman	AM	2022-2023	Brazil
Prof. Weiping Wu	AM	2022-2023	China/Beijing
Prof. Baoshan Xing	AM	2018-2023	United States
Prof. Doo Soo Chung	NR	2022-2023	South Korea
Dr. Jerome Francois	NR	2022-2023	France
Dr. Melanie Kah	NR	2022-2023	New Zealand
Prof. Roland Kallenborn	NR	2022-2023	Norway
Dr. Nadia Kandile	NR	2022-2023	Egypt
Dr. Oluseun Popoola	NR	2020-2023	Nigeria
Dr. Diana Rabadjieva	NR	2022-2023	Bulgaria
Prof. Hiroto Tamura	NR	2022-2023	Japan
Dr. Susanne Waaijers	NR	2022-2023	Netherlands
Prof. Cora Young	NR	2022-2023	Canada
	<i>Ex Officio</i>		
	10 TMs, 6 AMs, 10 NRs		

*For Council*



INTERNATIONAL UNION OF  
PURE AND APPLIED CHEMISTRY

**Membership - Division (VII)**  
***Chemistry and Human Health***  
**2022 - 2023**

Name	Status	Term	NAO
Dr. Helle Møller Johannessen	TM-President	2022-2023	Denmark
Prof. Rita Cornelis	TM-Past President	2022-2023	Belgium
Prof. Vladimir Gubala	TM-Vice President	2022-2023	United Kingdom
Dr. Linda Johnston	TM-Secretary	2022-2025	Canada
Dr. Balu Balasubramanian	TM	2020-2023	United States
Prof. Xiaohong Fang	TM	2020-2023	China/Beijing
Prof. Paula Gomes	TM	2022-2023	Portugal
Mrs. Ling Peng	TM	2022-2023	France
Dr. Thomas Perun	TM	2020-2023	United States
Mr. Brandon Presley	TM	2020-2023	United States
Dr. Vincenzo Abbate	AM	2020-2023	United Kingdom
Prof. Djibril Fall	AM	2022-2023	Senegal
Dr. Neale Jackson	AM	2022-2023	Australia
Prof. Silvana Raic-Malic	AM	2022-2023	Croatia
Prof. Milena Popova	AM	2020-2023	Bulgaria
Prof. Geok Bee (Sharon) Teh	AM	2022-2023	Malaysia
Dr. Tun-Cheng Chien	NR	2020-2023	China/Taipei
Prof. Janos Fischer	NR	2020-2023	Hungary
Prof. Arie Lev Gruzman	NR	2022-2023	Israel
Prof. Hassan Ibrahim	NR	2020-2023	Egypt
Prof. Iqbal Rauf Mamun	NR	2022-2023	Bangladesh
Dr. Abdullah Nuhu	NR	2020-2023	Nigeria
Prof. Roland Pieters*	NR	2018-2023	The Netherlands
Prof. Jaana Rysa	NR	2022-2023	Finland
Dr. Michele Saviano	NR	2020-2023	Italy
Dr. Gerd Schnorrenberg	NR	2022-2023	Germany
	10 TMs, 6 AMs, 10 NRs		

\*Executive Committee Approved Exception -1 July 2021

*For Council*



INTERNATIONAL UNION OF  
PURE AND APPLIED CHEMISTRY

**Membership - Division (VIII)**  
***Chemical Nomenclature and Structure Representation***  
**2022 - 2023**

Name	Status	Term	NAO
Dr. Michelle Rogers	TM-President	2022-2025	United States
Prof. Alan T. Hutton	TM-Past President	2022-2023	South Africa
Prof. Risto S. Laitinen	TM-Secretary	2016-2023	Finland
Dr. Thomas Engel	TM	2022-2023	Germany
Dr. Elisabeth Mansfield	TM	2020-2023	United States
Prof. Bongjin Moon	TM	2022-2023	South Korea
Ms. Molly Strausbaugh, <i>CAS rep</i>	TM	2022-2023	United States
Dr. Erik Szabo	TM	2022-2023	Slovakia
Prof. Augusto Tomé	TM	2022-2023	Portugal
Dr. Clare Tovee, <i>CCDC rep.</i>	TM	2022-2023	United Kingdom
Dr. Maria Atanassova Petrova	AM	2022-2023	Bulgaria
Prof. Michael A. Beckett	AM	2022-2023	United Kingdom
Prof. Edwin Constable	AM	2022-2023	Switzerland
Prof. Safiye Erdem	AM	2022-2023	Turkey
Prof. Robin Macaluso	AM	2020-2023	United States
Prof. Amélia Pilar Rauter	AM	2022-2023	Portugal
Dr. Ture Damhus	NR	2020-2023	Denmark
Prof. Ernesto de Jesus	NR	2022-2023	Spain
Prof. Nahla El-Wakil	NR	2022-2023	Egypt
Mr. Adeyinka Fasakin	NR	2020-2023	Nigeria
Prof. Max Malacria	NR	2022-2023	France
Dr. József Nagy	NR	2020-2023	Hungary
Prof. Ebbe Nordlander	NR	2022-2023	Sweden
Prof. Jiří Vohlídal	NR	2022-2023	Czech Republic
Prof. Guoqiang Yang	NR	2020-2023	China
Dr. Andrey Yerin	NR	2022-2023	Russia
Prof. Richard M. Hartshorn	<i>Ex officio (Sec Gen)</i>		New Zealand
Dr. Steve Heller	<i>Ex officio (InChI)</i>		United States
Leah R. McEwen	<i>Ex officio (CPCDS)</i>		United States
Dr. Gerard P. Moss	<i>Ex officio (JCBN)</i>		United Kingdom
Prof. G. Jeffery Leigh	<i>Emeritus Fellow</i>	2022-2023	United Kingdom
Dr. Alan McNaught	<i>Emeritus Fellow</i>	2022-2023	United Kingdom
Dr. Warren Powell	<i>Emeritus Fellow</i>	2022-2023	United States
	10 TMs, 6 AMs, 10 NRs		

*For Council*

# STATUTES, BYLAWS, AND STANDING ORDERS: 2017

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## Preamble

- P1**      **The Statutes and Bylaws should be read in the context of the following statements that reflect the core values of the International Union of Pure and Applied Chemistry (IUPAC).**
- P1.1      The Union will observe the basic policy of political nondiscrimination and affirms the rights of chemists of any country to adhere to or to associate with international activity in the field of chemistry without regard to race, religion, or political philosophy.
- P1.2      Scientific excellence and objectivity are the cornerstones of all IUPAC work.
- P1.3      IUPAC will value collaboration and communication among all our stakeholders.
- P1.4      IUPAC will strive for diversity and inclusiveness in all forms.
- P1.5      IUPAC members will respect each other and the Union.
- P1.6      IUPAC members will uphold the highest standards of transparent, responsible and ethical behavior.

## Statutes

### **S1      Definition of the Union**

The International Union of Pure and Applied Chemistry (IUPAC) (hereafter referred to as “the Union”) is a voluntary, nongovernmental, nonprofit association of organizations each representing the chemists of a member country, a member country being a country whose Adhering Organization has joined the Union.

### **S2      Objectives**

The objectives of the Union are as follows:

- S2.1      to promote continuing cooperation among the chemists of the member countries;
- S2.2      to study topics of international importance to pure and applied chemistry which need standardization or codification;
- S2.3      to cooperate with other international organizations that deal with topics of a chemical nature;
- S2.4      to contribute to the advancement and understanding of pure and applied chemistry in all its aspects.

### **S3      Membership**

- S3.1      A country may join the Union through only one national organization representing its chemists. This Adhering Organization may be a national chemical council, a national society representing chemistry, a national academy of science, or any other institution or association of institutions representative of national chemical interests.
- S3.2      The Adhering Organizations are the Members of the Union.
- S3.3      A country requesting admission to the Union shall provide full information about its proposed Adhering Organization.
- S3.4      An Adhering Organization may withdraw from the Union provided that it has fulfilled its financial obligations or may be removed from the Union for failure to fulfill such obligations.

**S4 Organization**

- S4.1 The organization of the Union comprises its Council, a Bureau, an Executive Committee, Standing Committees, Divisions, Commissions, and other appropriate bodies as determined by the Council.
- S4.2 A General Assembly of the International Union of Pure and Applied Chemistry shall be held normally each second year and shall consist of a set of meetings of the Council and such other bodies of the Union as the Bureau shall decide. Where the duration of office of Officers of the Union, Elected Members of the Bureau, and Titular Members and Associate Members of Division Committees, Commissions, or other bodies of the Union is referred to in these Statutes, it shall begin on 1 January of the year following their election at a General Assembly and shall end on 31 December of the year when the appointment is due to terminate. In the filling of casual vacancies, the Bureau may authorize an appointment to Division Committees, Commissions, and other bodies of the Union except for the Executive Committee and Bureau to begin at an intermediate date. Any such appointment should be regarded as dating from 1 January of the year following the previous General Assembly in respect of the period of office for Division Committees, and Commissions. No person shall hold more than three appointments to bodies of the Union, except at the discretion of the Bureau in respect of membership of a subcommittee or acting as an official representative within or outside the Union.
- S4.3 The official headquarters of the Union shall be in Zürich (Switzerland) until otherwise decided by the Council. Any change in location requires the approval of two-thirds of the total number of votes assigned to the Adhering Organizations.
- S4.4 The legal domicile of the Union is accepted by Finanzdirektion des Kantons Zürich as an Association under Swiss Law and for legal purposes the Union will act in accordance with Articles 60 and following of the Swiss Civil Code and by the present Statutes.

**S5 Council**

- S5.1 The Council, to which the Bureau, Executive Committee, Standing Committees, Divisions, Commissions, and all other bodies of the Union are responsible, is composed of the Delegations of the Adhering Organizations. Each Delegation shall be assigned a specific number of votes/Delegates (1–6) according to principles decided by the Council. Each Adhering Organization shall appoint its Delegates for every Council meeting.
- S5.2 Meetings of Council may be held in person, a combination of in person and virtual or as a purely virtual meeting; in the last case, the chair of the meeting and a person who prepares the minutes must be physically present at the meeting in the same geographical location. Regular meetings of the Council shall take place every two years as part of a General Assembly; special meetings may be convened by the President of the Union and shall be convened by the President at the request of one-third of the total number of Adhering Organizations, which shall specify the reason for such requests.

- S5.3 No decision of the Council shall be valid unless taken at a meeting of the Council at which at least one-half of the maximum number of votes is represented.
- S5.4 For all voting by the Council, abstentions shall not be recorded as votes.
- S5.5 The voting procedure to be adopted is different according to whether a proposal is a scientific or nonscientific matter. The Presiding Officer shall decide whether for the purpose of voting a matter shall be of a scientific or nonscientific nature, and that decision shall be final. The method of voting shall be specified in the Bylaws.
- S5.6 There shall be no voting by proxy.
- S5.7 Functions of the Council not mentioned in other Articles of these Statutes shall be as follows:
- S5.7.1 to elect the Officers of the Union and the Elected Members of the Bureau;
  - S5.7.2 to discuss and determine the general policy of the Union;
  - S5.7.3 to approve the Statutes and Bylaws of the Union and changes therein;
  - S5.7.4 to approve the terms of reference of the Bureau, Executive Committee, Standing Committees, Divisions, Commissions, and all other bodies of the Union as prescribed in the Statutes and Bylaws;
  - S5.7.5 to determine every four years, the one language in which the official records of the meetings of the Council, Bureau, and Executive Committee shall be kept and published;
  - S5.7.6 to receive and consider reports
    - (i) By the President on the state of the Union,
    - (ii) By the Bureau, Executive Committee, Division Presidents, and other bodies of the Union;
  - S5.7.7 to ratify decisions taken by the Bureau and Executive Committee between General Assemblies;
  - S5.7.8 to consider and adopt or reject the accounts of the Union;
  - S5.7.9 to examine and establish the budget of the Union for the next two financial years;
  - S5.7.10 to determine the dates and place of General Assemblies;
  - S5.7.11 to take such other actions as are required in the exercise of its authority under the Statutes and Bylaws.
- S5.5 The official text of a report shall be in the official language of the Union.

**S6 Officers**

- S6.1 The Officers of the Union shall be the President, the Vice-President, the Past-President, the Secretary General, and the Treasurer.
- S6.2 The President shall hold office for two years and shall not be reelected.
- S6.3 The President as the administrative head of the Union shall preside at the meetings of the Council, of the Bureau, and of the Executive Committee and shall be *ex officio* a member of all bodies of the Union. The President may delegate power as chief representative of the Union and to preside at meetings to the Vice-President, to another Officer of the Union, or to an Elected Member of the Bureau. When neither the President nor the Vice-President is able to perform the functions of the office of President, the immediate Past-President or, if absent, an Elected Member of the Bureau, chosen by the Bureau, shall assume temporarily the office of President.
- S6.4 The President shall submit to each regular meeting of the Council a report on the general state of the Union.
- S6.5 The Vice-President, designated as President-Elect, shall assume the office of President in the event of the President being unable to perform the functions of that office, without prejudice to the forthcoming period of office as President.
- S6.6 The Vice-President shall submit to the Bureau a critical assessment of the programs and the projects of all IUPAC bodies.
- S6.7 The Secretary General shall carry out the business of the Union as specified by the Council, by the Bureau, by the Executive Committee, or by the President, and be responsible for keeping its records and for the administration of the Secretariat.
- S6.8 The Secretary General shall be elected for four years and be eligible for reelection up to a maximum of a further four years.
- S6.9 The Treasurer shall be responsible for the accounts of the Union, shall prepare a budget for approval by the Bureau and the Council, shall approve expenditures from the funds of the Union, and, subject to the approval of the Executive Committee, shall be responsible for the investment and custody of the funds of the Union. The Treasurer shall ensure that an appropriate record of all financial authorities and transactions is maintained.
- S6.10 The Treasurer shall be elected for four years and be eligible for reelection up to a maximum of a further four years.
- S6.11 To assist in the administration of the business of the Union, the Executive Committee shall appoint an Executive Director responsible to the President and Executive Committee (Bureau, Council) through the Secretary General and in financial matters through the Treasurer.
- S6.12 The Secretariat shall consist of an Executive Director and any such other staff as approved by the Executive Committee.
- S6.13 The Council shall establish a Bureau to act for the Union during intervals between meetings of the Council, except on matters specifically excluded from its delegated authority.
- S6.14 The Council shall establish Standing Committees to advise the President and the Executive Committee; such bodies shall include a Finance Committee.

**S7 Bureau**

- S7.1 The Bureau shall normally meet once a year and at other times when the President considers it to be desirable. In a year when the General Assembly meets, a meeting of the Bureau shall take place during the General Assembly.
- S7.2 The Bureau shall consist of the President, the Vice-President, the Secretary General, and the Treasurer, the immediate Past-President, and Presidents of Divisions, together with not less than ten other members elected by the Council who shall be known as Elected Members. The period of service of these Elected Members of the Bureau shall be four years. The periods of service shall be arranged in such a way as to ensure continuity. These Elected Members are eligible for reelection to the same office for one more period of four years. No President of a Division may be simultaneously an Elected Member of the Bureau. Unless exceptional circumstances are established and special permission of the Council is granted, no Adhering Organization shall have more than one Elected Member on the Bureau, and the principle of fair geographical representation of Members shall be taken into account. The Council shall specify those bodies of the Union whose Chairs shall also be designated Members of the Bureau; such Members shall have full voting powers.
- S7.3 In case of an emergency which prevents the holding of elections, the Officers of the Union, the Elected Members of the Bureau, and the Presidents of the Divisions will continue to serve until statutory elections can be held.
- S7.4 The principal duties of the Bureau and its members, subject always to the Statutes and Bylaws, are as follows:
- S7.4.1 to ensure the strict observance of Statutes and Bylaws;
  - S7.4.2 to prepare the agenda for meetings of the Council and to make provisions for elections;
  - S7.4.3 to make recommendations thereon to the Council;
  - S7.4.4 to attend the meetings of the Council;
  - S7.4.5 to implement the decisions of the Council and execute the program of the Union as directed by the Council;
  - S7.4.6 to take steps to ensure that IUPAC World Chemistry Congresses are held;
  - S7.4.7 to take decisions about the holding of scientific meetings as proposed by Divisions and Standing Committees;
  - S7.4.8 to take all other steps necessary for the good conduct of the affairs of the Union.
- S7.5 The Bureau may neither elect Officers of the Union nor admit nor remove Members of the Union, but it may fill temporarily vacancies among the Officers pending the next regular meeting of the Council, when the Council shall fill such vacancies.
- S7.6 The Bureau may fill casual vacancies in accordance with Statute 4.2.
- S7.7 The Bureau shall establish an Executive Committee to act for it in ensuring an orderly discharge of the functions of the Union.

**S8 Executive Committee**

- S8.1 The Executive Committee may formulate standing orders to facilitate its discharge of the foregoing functions.
- S8.2 The Executive Committee shall be limited to eight members and shall include the President, the Vice-President, the Secretary General, the Treasurer, and the immediate Past-President. The other members shall be elected by the Bureau from among its Elected Members. The period of service of an Elected Member shall be four years or until the end of the term as a Bureau Member, whichever is the shorter. An Elected Member is eligible for reelection to the same office for one more period of four years. Terms of office shall be arranged such as to ensure continuity.

**S9 Finance**

- S9.1 Each Adhering Organization shall pay an annual subscription to the Union, due 1 January and payable before 31 December in each year. The minimum amount of this annual subscription shall be decided from time to time by the Council.
- S9.2 Any Adhering Organization in arrears with its subscription for a period of twelve months from the due date, shall be warned, shall be deprived of its voting rights, and all publications of the Union shall be withheld from it. Any Adhering Organization in arrears for a period of twenty-four months from the due date shall automatically cease to be a Member of the Union. Partial payment of the subscription shall be regarded as nonpayment, unless the Union exceptionally waives the outstanding subscription. Membership of bodies of the Union of all persons belonging to an Adhering Organization, which ceases to be a Member, shall continue at the discretion of the Bureau to the end of the period of service.
- S9.3 Any Adhering Organization that shall withdraw (see also Statute 3.4) or cease for any reason to be a Member of the Union shall forfeit claims upon the funds of the Union.
- S9.4 In addition to the annual subscription, the Union may receive financial contributions from other sources, such as gifts, bequests, and legacies. The Executive Committee may set up any auxiliary bodies to the Union that will enable such financial contributions to be received.
- S9.5 None of the constituent bodies of the Union (e.g., a Division) may solicit funds for Union purposes from organizations other than the Union until the specific approval of the Bureau of the Union has been obtained. The disposal of any such funds shall be only with the approval of the Bureau.
- S9.6 Any expenditure from the funds of the Union shall require authorization from the Treasurer, acting on behalf of the Bureau. The Treasurer may delegate to the Executive Director the expenditure of funds of the Union according to the budget approved by Council.
- S9.7 Members of IUPAC bodies may receive contributions towards travel and subsistence expenses from funds of the Union, as authorized by the Treasurer. The Bureau shall establish procedures and guidelines for the approval of such expenses.

**S10 Divisions and Commissions**

- S10.1 The scientific work of the Union shall be undertaken by the Divisions, which shall be responsible to the Bureau and which shall represent within the Union the branches of chemistry indicated by their Divisional titles, and by such other bodies as are appointed by the Council.
- S10.2 Divisions may be created, and existing ones may be dissolved or modified by the Council. The initial Members of Division Committees shall be appointed by the Council.
- S10.3 The procedures of each Division shall be governed by the Bylaws but a Division may also adopt rules which shall be in accord with the general policy of the Union, its Statutes and Bylaws, and which shall be subject to the approval of the Council.
- S10.4 Each Division may include such Commissions as are approved by the Council.
- S10.5 Joint Commissions between Divisions and/or Joint Commissions between the Union and other international scientific bodies may be attached to one of the Divisions or to the Bureau of the Union as decided by the Council. Rules for such joint bodies shall, if necessary, be set up by the Division Committee or by the Bureau, as the Bureau shall decide.
- S10.6 A Division Committee may appoint such subcommittees as are appropriate to the work of the Division and its Commissions.

**S11 Standing Committees**

Standing orders for these committees shall be determined by the Council. Members shall be appointed by the President of the Union.

**S12 Attendance at meetings**

Attendance at meetings of bodies of the Union shall be restricted to members of those bodies and observers as approved by the meeting Chair. The names of approved observers shall be communicated to the Secretary General via the Secretariat.

**S13 Associated Organizations**

The Council may decide to associate with existing international organizations whose aims and activities are in harmony with those of the Union. Their international scope of activities, with no a priori limitation to a part of the world, shall be explicit in their title or statutes. In the case of apparent competition with another international organization already associated with IUPAC, the Council shall make a choice and decide with which organization IUPAC wishes to be associated, while avoiding to associate with both at the same time. These organizations shall then be known as Associated Organizations of the Union.

**S14 Company Associates**

Organizations such as industrial companies, research and development institutions and laboratories, scientific societies, or any other bodies interested in the activities of the Union may become associated with it as Company Associates. The conditions under which such association shall occur or continue, including the determination of the minimum amount of annual subscription or donation shall be decided by the Council on the recommendation of the Bureau.

**S15 Congresses and Other Scientific Meetings**

- S15.1 At suitable intervals, World Chemistry Congresses shall be organized under the auspices of the Union. These Congresses shall comprise one or more branches of chemistry represented by the Divisions of the Union. The Council shall approve the scope of each Congress on the recommendation of the host country, with a view to achieving, by suitable rotation, the coverage of all branches of pure and applied chemistry. The Council shall also decide upon the place and dates of the Congress. The arrangements for such a

Congress shall be entrusted to a committee set up in the host country. This committee shall cooperate with the Bureau, the Officers of the Union, and the appropriate Divisions and Standing Committees.

S15.2 Cooperation of the Union in the organization of a Congress shall not involve the Union in financial responsibility.

S15.3 The Council may organize other scientific meetings or may offer the collaboration of the Union in the planning and arrangement of scientific meetings initiated by other organizations.

**S16 Adoption, Changes, and Interpretation of Statutes**

S16.1 The Statutes shall take effect immediately after their adoption by the Council.

S16.2 The English text of the Statutes shall be used exclusively as the authorized text for the interpretation of the Articles of the Statutes and Bylaws, but the Council may approve the Issue by the Union of versions in other languages.

S16.3 Changes in the Statutes may be proposed by the Bureau or any Adhering Organization. Notice of changes so proposed shall reach the Secretary General via the Secretariat in writing at least six months before the meeting of the Council at which the proposal is to be considered. No change shall be made except at a meeting of the Council and with the approval of two-thirds of the total number of votes assigned to the Adhering Organizations.

S16.4 In all cases where the Statutes are not clear or do not give a decision, the President's ruling shall be decisive.

**S17 Duration**

The Union shall not be dissolved except at a meeting of the Council convened specifically for this purpose by notice given three months in advance. At such a meeting, more than three-quarters of the maximum possible number of votes of the Adhering Organizations must be represented and cast, and two-thirds of the votes recorded shall be required for dissolution. If three-quarters of the maximum possible number of votes are not represented, the Council shall be convened again after a period of at least six months and at this second meeting the Union may be dissolved if the proposal for dissolution receives two-thirds of the votes recorded. In the case of dissolution of the Union, the Council shall appoint three trustees to carry out the liquidation of the assets of the Union. The net assets shall be transferred to one or more international scientific organizations.



## Bylaws

### **B1 Membership (cf. Statute 3)**

A request of a country for admission to the Union can be received in writing, together with the appropriate documentation, by the Secretary General via the Secretariat at any time. It will then be considered by the Executive Committee, Bureau, or Council, whichever meets next after the application has been received, and if approved, membership shall begin on 1 January of the following year, provided that payment of that year's dues are received. The admission of a new Member approved by the Executive Committee or Bureau must be ratified by the Council at its next regular meeting. If payment has been received of the dues for the current year, the Council may allow a newly admitted National Adhering Organization to vote at the current Council meeting, on all items after the ratification of membership.

### **B2 Voting Procedure in Council (cf. Statute 5)**

#### **B2.1 Scientific Matters**

B2.1.1 Recommendations of a scientific nature received from Divisions, or other bodies of the Union, shall be the responsibility of the Council. The Council may adopt them by a simple majority of personal votes cast by the Delegates present at a regular meeting. Between such meetings, the Bureau may act on behalf of the Council in these matters. The Bureau shall establish procedures for approval of recommendations in nomenclature, symbols, terminology, and conventions.

B2.1.2 Postal and electronically submitted ballots on scientific matters may be conducted in accordance with a procedure to be determined by the Bureau for each ballot.

#### **B2.2 Nonscientific Matters**

Voting on non-scientific matters shall be by Delegations, each Delegation being entitled to cast the number of assigned votes. All the votes to which the Adhering Organization is entitled shall be cast in the same sense. Voting rights must be exercised by the Delegations in real time.

##### **B2.2.1 Admission and Removal of Members**

Admission of Members shall be by a simple majority of votes recorded at a regular meeting of the Council. Removal of an Adhering Organization shall be valid only if at least three-quarters of the votes recorded at a regular meeting of the Council are cast in favor of such removal. Any reassignment approved by the Council shall become effective on 1 January of the following year.

**B.2.2.2 Elections**

For election of Officers of the Union and Elected Members of the Bureau the following rules shall apply:

- B2.2.2.1 Nominations may be made by the Adhering Organizations. These nominations must be received in writing by the Secretary General via the Secretariat at least two months before the beginning of the meeting of the Council at which the elections will take place. They must indicate clearly the position for which each candidate is nominated and shall be accompanied by a biographical note on each candidate.
- B2.2.2.2 The Bureau shall discuss the nominations made by the Adhering Organizations at a meeting prior to the meeting of the Council at which the elections are to take place. It has the right to make additional nominations for which information shall be provided. When the number of nominations exceeds the number of vacancies, the Bureau may make recommendations to the Council for filling the vacancies. These recommendations are not binding on the Council.

The officers of the Union and the Elected Members of the Bureau, as defined by the Statutes, shall be elected at a regular meeting of the Council by a secret ballot, a simple majority of the votes recorded being required for election. The election for each officer shall be held separately. If no nominee receives a majority on the first ballot, the nominee receiving the smallest number of votes shall be eliminated from the next ballot and successive ballots shall be held until a nominee receives a simple majority of the votes recorded or there are only two nominees on which to vote. If two nominees get an equal number of votes, the Presiding Officer, after consultation with the Executive Committee, shall cast the deciding vote.

For election of Elected Members of the Bureau, the nominees receiving the highest number of votes shall be elected to the vacancies, provided that the number of votes cast for each such nominee shall be a majority of the total votes cast per vacancy. If fewer nominees than the vacancies receive a majority of such votes cast, then those receiving a majority shall be declared elected and a second ballot conducted among the remaining nominees for the remaining vacancies. If, in this second ballot, no nominee receives a majority, the nominee receiving the smallest number of votes shall be eliminated from the next ballot and successive ballots conducted until all vacancies are filled. In each ballot, the number of names on ballot papers or in electronic format, submitted by each Delegation shall be no more and no less than the number of vacancies outstanding at the conclusion of the previous ballot.

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### **B2.2.3 Other Nonscientific Matters**

Proposals on other nonscientific matters, after consideration, may be adopted without a formal vote unless objections are raised, when a vote shall be taken. Unless specifically stipulated otherwise in the Statutes and Bylaws, a simple majority of the votes recorded shall be required for adoption.

### **B2.2.4 Postal and Electronically Transmitted Ballots**

Electronically transmitted ballots on non-scientific matters may be conducted with each Adhering Organization being entitled to cast the number of assigned votes, provided always that decisions on the location of the official headquarters of the Union and the dissolution of the Union are excluded from such electronically transmitted ballots. Action shall only be taken if more than one-half of the maximum possible number of votes has been received. A simple majority of the votes shall be required for a decision, except for decisions on admission and removal of Members (voting requirements in B2.2.1) or decisions on changes to Statutes and Bylaws (voting requirements in S16.3 and B5.2, respectively).

### **B2.2.5 Additions to Council Agenda**

Matters to be considered at a meeting of the Council must appear on the agenda of that meeting, which shall be sent to the Adhering Organizations at least four months before the meeting is to be held. However, in case of urgency, a question may be added to the agenda with the consent of at least three-quarters of the Delegates present at the meeting. Modification of the Statutes or Bylaws, admission or removal of Members, and elections of Officers or Elected Members of the Bureau, are excluded from this procedure.

## **B3 Divisions and Commissions (cf. Statute 10)**

### **B3.1 Division Committees**

B3.1.1 Each Division shall be administered by a Division Committee consisting of Titular Members, Associate Members, and National Representatives with appropriate expertise.

B3.1.2 The Titular Members, Associate Members, and National Representatives of a Division Committee and of Commissions within a Division shall together form the Membership of the Division.

B3.1.3 The Division Committee shall be the organ of liaison between the Bureau on the one hand and the various bodies constituting the Division on the other hand.

B3.1.4 Nominations to the position of Titular Member may be made by Adhering Organizations or by members of the Nominating Committee. Titular Members must be from a member country. The Nominating Committee for each Division will be established before each election and will consist of not more than five people, of whom at least three must be from outside the Union. The Titular Members of each Division Committee shall be chosen by an electorate comprising the Titular Members, Associate Members, and National Representatives on the Division Committee, together with the members or officers of such other bodies within the Division that the Bureau may specify (currently the Chairs, Secretaries and Titular Members of Commissions associated with the Division, Task Group Chairs of active projects, and members of the current and previous Nominating Committee). The number of Titular Members shall not exceed ten unless otherwise determined by the Bureau. Titular Members are elected for two-year terms. The term of service of a Titular Member shall be not more than four consecutive years but shall cease on election as an Officer. If a Titular Member is unable to take up their post, it shall be offered to the highest polling unsuccessful candidate in the election. The Vice-President and the President of a Division shall not hold these respective offices for more than four consecutive years; the Secretary of a Division shall serve for four consecutive years and be eligible for re-election up to a maximum of a further four years. Exceptional circumstances must be established, and special permission of the Bureau granted for Titular or Associate Membership of the same or more than one Division Committee beyond a total of twelve years of total Titular and Associate Membership, whether the Memberships are consecutive or not.

The immediate Past-President of the Division shall be one of the Titular Members of the Division Committee for a period of two years. In addition to these Titular Members, the President, Vice-President, Past-President, Secretary General, and Treasurer of the Union shall be *ex officio* Members of all Division Committees.

Nominations to the position of Associate Member may be made by Adhering Organizations, by members of the Nominating Committee, or by Company Associates. Associate Members must be from a member country or be an Affiliate Member of the Union. The number of Associate Members, who shall have full voting rights, shall not exceed six. The term of service of an Associate Member shall be two years, with the possibility of re-election consecutively for two more years only.

A newly elected Titular Member, Associate Member, or National Representative of a Division Committee shall assume office only after approval by the Bureau or Executive Committee. The Adhering Organization with which the Titular Member or Associate Member is connected shall be notified of the appointment.

A Division Committee may elect no more than ten National Representatives on the nomination of Adhering Organizations, with no more than one representative from a given Adhering Organization. The term of a National Representative, who shall have full voting rights, shall be two years, with the possibility of re-nomination and re-election consecutively for only two more years. Exceptional circumstances must be established, and special permission obtained from the Bureau for the election of a National Representative from a country already represented on the Committee by a Titular or Associate Member.

B3.1.5 The Division Committee shall elect from among its existing and, subject to confirmation, new Titular Members, a President, a Vice President designated as President-Elect and a Secretary. These elections shall be subject to approval by the Council.

- B3.1.6 The Division Committee may form a Division Executive Committee, consisting of the President, the Vice-President designated as President-Elect, and the Secretary of the Division, to carry out the necessary administrative duties between meetings of the Division Committee.
- B3.1.7 The functions of the Division Committee shall be as follows:
- B3.1.7.1 to initiate, approve, and manage projects;
  - B3.1.7.2 to plan and organize scientific meetings and engage in other activities that are deemed useful in furthering the objectives of the Division; this includes the approval of Union sponsorship of scientific meetings;
  - B3.1.7.3 to manage a budget for a Division in accordance with a procedure prescribed by the Treasurer;
  - B3.1.7.4 to advise the Bureau for recommendations to the Council on scientific matters;
  - B3.1.7.5 to propose to the Council through the Bureau the establishment of Commissions to be attached to it and to appoint the membership and the initial officers of these, the appointments having to be approved by the Council;
  - B3.1.7.6 to propose to the Council through the Bureau the dissolution of existing Commissions when required;
  - B3.1.7.7 to supervise the work of its Commissions and other bodies.
- B3.1.8 The Division Committee shall meet at least every two years, during a General Assembly.
- B3.1.9 Decisions of the Division Committee must receive the approval of the Bureau when they would have financial consequences involving the budget of the Union. In addition, in order to ensure the fullest coordination between the activities of all the Divisions, the Secretary General via the Secretariat shall be informed of all other decisions taken by the Division Committee.
- B3.1.10 At a General Assembly, the Division President shall report to the Council on the activities of the Division since the last General Assembly. In a year in which a General Assembly is not held, the Division President shall present to the Division Committee and to the Bureau a written report on the activities of the Division since the last General Assembly.
- B3.1.11 Each Division shall make provision for the conduct of the work of its Commissions and other bodies. Such provision, which must receive the approval of the Bureau, may be incorporated in Divisional rules.

## B3.2 Annual Meeting of Division Presidents

A meeting of the Division Presidents shall be held each year. At this meeting, topics that are of interest for cooperation between the Divisions or between the Divisions on the one hand and the Council, the Bureau, and the Executive Committee on the other hand shall be discussed and the meeting may make recommendations to the Bureau.

The meeting shall be presided over by one of the Division Presidents elected for this task at the previous meeting. The Secretary General shall be invited to attend.

## B3.3 Commissions

B3.3.1 On the recommendation of a Division Committee, through the Bureau, the Council may create a Commission of the Division. Each Commission shall have as its objective the study of topics of international scientific or technical significance requiring agreement, standardization, or codification in some aspect of pure or applied chemistry. The terms of reference of a new Commission shall be clearly described and approved by the Council. If a Division Committee wishes to create a Commission, it must apply to the Bureau for the appointment of an ad hoc committee of three persons who shall study the question and then report back to the Bureau. This report, if favorable to the creation of a new body, shall contain an indication as to the probable duration of the life of the new body and an estimate of its annual cost.

B3.3.2 At each General Assembly, the Council shall, in the light of the Division President's report and on the recommendation of the Bureau, decide whether or not to continue each Commission.

B3.3.3 Each scientific and technical Commission shall be composed entirely of specialists. They may consist of Titular Members, Associate Members, and National Representatives, who all shall have full voting rights.

Each Commission shall elect from among its existing and, subject to confirmation, new Titular Members by a simple majority a Chair, a Secretary, and, if desired also a Vice-Chair. These elections are subject to approval by the Bureau.

B3.3.4 The Membership of each new Commission is determined by the Council. Thereafter, both Titular Members and Associate Members may be nominated by the Commission but shall assume office only after approval by the Division Committee and by the Bureau or Executive Committee. The terms of service of Titular Members and Associate Members shall be two years, with the possibility of re-election for two years of Membership up to a maximum of eight years. The sum of the years of service as a Titular Member, including service as Chair, Vice-Chair, or Secretary, shall not exceed a total of ten years, whether these are consecutive or not, and further appointment thereafter as an Associate Member shall be for two years only. The rotation of a person through alternate periods of Titular and Associate Membership may be permitted to a total of twelve years. Exceptional circumstances must be established, and special permission of the Bureau granted for:

- (i) the reappointment as a Titular Member of a person who has served eight years as a Titular Member, whether these are consecutive or not. The extension shall be for a period of two years.
- (ii) the rotation of a person through alternate periods of Titular and Associate Membership beyond a total of twelve years, whether these are consecutive or not. The extension shall be for a period of two years.
- (iii) membership in any capacity, other than that of National Representative, of one or more Commissions of a Division or of different Divisions beyond a total of

twelve years, whether these are consecutive or not. The extension shall be for a period of two years.

- (iv) the replacement by a Division President between General Assemblies of a Member of a Commission.

The number of Titular Members, Associate Members, and National Representatives of each Commission shall not exceed eight. Titular Members, Associate Members, and National Representatives shall be authorities in the field covered by the Commission and shall be so recognized by their Adhering Organizations. Before submitting their names for election, the Chair of the Commission shall explain to them their duties, and they shall agree to undertake them if they are elected.

The choice of a Titular Member or an Associate Member by a Commission may take place either during a meeting of the Commission or by correspondence. The nomination shall then be submitted via the Division Committee to the Secretary General via the Secretariat for approval by the Bureau or Executive Committee. The Adhering Organization with which the Titular Member or Associate Member is connected shall be notified of the appointment.

- B3.3.5 National Representatives may be nominated by the various Adhering Organizations and approved by the Commission; such representation shall not be permitted if the Commission already has a Titular or Associate Member from that Organization, unless exceptional circumstances are established and special permission is granted by the Bureau. Such representation shall lapse at the conclusion of the next General Assembly unless the person is re-nominated by his/her Adhering Organization and re-approved by the Commission. Re-appointment of National Representatives beyond a total of twelve years' service, whether these are consecutive or not, requires that special circumstances should be established by the Adhering Organization. The names of these National Representatives shall be communicated to the Secretary General via the Secretariat by the Chair of the Commission concerned.
- B3.3.6 The Division President shall be *ex officio* a member of all the Commissions attached to the Division.
- B3.3.7 A Commission may propose to the Division Committee the establishment of subcommittees with responsibility for designated functions within the scope of the Commission.
- B3.3.8 A meeting of a Commission can be financed only upon authorization of the Treasurer after recommendation by the appropriate Division Committee.
- B3.3.9 The Chair of a Commission shall each year present to the Division Committee a written report on the activities of the Commission, outlining the results obtained and indicating any new work that is to be undertaken.
- B3.3.10 All reports of Commissions shall be forwarded via the Division Committee to the Bureau, and then submitted to the Council if required by Bylaw 2.11.

**B4 Associated Organizations (cf. Statute 13)**

- B4.1 The Bureau, having satisfied itself that the claims and activities of an organization seeking to become an Associated Organization of the Union are in accordance with Statute 13, may recommend acceptance to associate membership by the Council provided that:
- (i) the period of existence of the applicant organization has been adequate to establish its stability and the quality of its activities;
  - (ii) the statutes and bylaws of the organization do not conflict with the Statutes and Bylaws;
  - (iii) the activities of the organization neither duplicate nor are in conflict with the legitimate functions of the Union, such as standardization, codification, or other matters of scientific importance.
- B4.2 The Union shall invite Associated Organizations to send representatives to its General Assembly and to relevant meetings of IUPAC bodies when joint sponsorship of meetings or other joint activities may be discussed.
- B4.3 The Union shall offer assistance in publicizing meetings of Associated Organizations.
- B4.4 The Union shall present to Associated Organizations such particulars as are decided by the Officers of the Union to be relevant to joint activities.
- B4.5 The continuation of membership of each Associated Organization shall be reviewed by the Council every four years.

**B5 Adoption, Changes, and Interpretation of Bylaws**

- B5.1 The Bylaws shall take effect immediately after their adoption by the Council.
- B5.2 Changes in the Bylaws may be proposed by the Bureau or by any Adhering Organization. Notice of changes so proposed shall reach the Secretary General via the Secretariat in writing at least six months before the meeting of the Council at which the proposal is to be considered. A change shall be made only if more than one-half of the total number of votes assigned to the Adhering Organizations is cast in favor of such a change.
- B5.3 In all cases where the bylaws are not clear or do not give a decision, the President's Ruling shall be decisive.

## Standing Orders for Standing Committees

### FINANCE COMMITTEE (FC) Composition and Term of Office

- (i) There shall be a standing Finance Committee, composed of a Chair and up to four other Titular Members. In addition, the Treasurer and Executive Director (to act as Secretary) shall be *ex officio* Members, but without voting power.
- (ii) The President, in consultation with the Executive Committee, shall appoint the Chair. The Finance Committee may propose candidates.
- (iii) The period of service of the Chair shall not exceed eight years. The sum of the years of service as a Titular Member and as the Chair shall not exceed ten years.
- (iv) The President, in consultation with the Executive Committee, shall appoint the Titular Members. The Finance Committee may propose names of persons suitably qualified for appointment.
- (v) The period of service of the Titular Members shall be normally be four years, renewable for a further term of four years.
- (vi) The Membership shall be reviewed every two years by the incoming President, in consultation with the Executive Committee.

### Terms of Reference

- (i) To advise the President and the Executive Committee on financial matters.
- (ii) To make financial recommendations for decision by the President and/or the Executive Committee.
- (iii) To review the IUPAC securities at least annually and to make such changes as appear appropriate.
- (iv) The Finance Committee shall not have executive functions, except with respect to dealings in securities. The Finance Committee shall have executive authority with respect to selection, purchases, and sales of securities held by IUPAC, provided that the Treasurer concurs with the decisions of the Finance Committee. The Finance Committee may delegate certain responsibilities to professional experts in various fields.

## COMMITTEE ON PUBLICATIONS AND CHEMINFORMATICS DATA STANDARDS (CPCDS)

### Composition and Terms of Office

- (i) There shall be a Standing Committee on Publications and Cheminformatics Data Standards composed of a Chair, a Secretary, and at least five and not more than eight other Titular Members. With the approval of the President, in consultation with the Executive Committee, up to three Associate Members may also be appointed.
- (ii) The President, in consultation with the Executive Committee, shall appoint the Titular Members and the Associate Members. The Committee on Publications and Cheminformatics Data Standards may propose names of persons suitably qualified for appointment and should conduct elections, according to the pattern for Divisions, in order to inform the advice that they give to the President.
- (iii) The period of service of a Titular Member and of an Associate Member shall be four years, renewable for a further term of four years.
- (iv) The Membership shall be reviewed every two years by the incoming President, in consultation with the Executive Committee.
- (v) The President, in consultation with the Executive Committee, shall appoint the Chair. The Chair shall appoint a Secretary. The Committee on Publications and Cheminformatics Data Standards may propose candidates.
- (vi) The period of service of the Chair shall not exceed eight years. The sum of the years of service as a Titular Member or an Associate Member and as the Chair shall not exceed ten years.
- (vii) The period of service of the Secretary shall not exceed eight years. The sum of the years of service as a Titular Member or an Associate Member and as the Secretary shall not exceed ten years.
- (viii) The Scientific Editor of *Pure and Applied Chemistry* shall be an *ex officio* Member of the Committee. The Scientific Editor shall have all the rights of a Titular Member but is not counted as one of the Titular Members defined in (i).

### Terms of Reference

- (i) To advise the President, Executive Committee, other Standing Committees, Divisions, and Commissions on all aspects of the design and implementation of printed and electronic publications, including computerized databases of all sorts, and to promote the compatibility of the storage, and management of digital content through the development of standards for the creation of a consistent, global framework for human and machine-readable chemical information.
- (ii) To make recommendations to the President and the Executive Committee on matters of policy and procedures related to the production and dissemination of printed and electronic publications.
- (iii) To advise the Secretary General and the Executive Director on hardware and software requirements for the Secretariat and on the development and operation of its computer systems.
- (iv) Subject to approval by the President and the Executive Committee, to establish Advisory Boards, Subcommittees, and Task Groups as needed to carry out specific functions of the Committee.

## PURE AND APPLIED CHEMISTRY EDITORIAL ADVISORY BOARD (PAC-EAB)

### Composition and Terms of Office

- (i) There shall be an Editorial Advisory Board (EAB) for the IUPAC journal *Pure and Applied Chemistry (PAC)*, comprising the Secretary-General (*ex officio*), the President of each Division or his/her nominated representative (*ex officio*), the Chair of the Committee for Publications and Cheminformatics Data Standards or his/her nominated representative (*ex officio*), the Chair of the Interdivisional Committee for Terminology, Nomenclature and Symbols or his/her nominated representative (*ex officio*), the Scientific Editor (*ex officio*), and up to six invited members.
- (ii) The *ex officio* members shall serve for the duration of their IUPAC appointments, subject to confirmation at each General Assembly. Invited members shall be nominated by the President and appointed in consultation with the Executive Committee. Their period of service shall be four years, renewable for a further term of four years.
- (iii) The Secretary-General shall Chair any meetings of EAB members, and the Secretariat shall maintain records of such meetings.

### Terms of Reference

- (i) The EAB shall monitor scientific and editorial standards of *PAC*, and advise and assist on all aspects of planning, implementation, and evaluation of publication policy and practice.
- (ii) The EAB shall respond to requests for critical evaluation of *PAC* activities and initiatives.
- (iii) The *ex officio* members of the EAB shall be responsible for reporting back to their respective IUPAC constituencies on relevant *PAC* matters.

## INTERDIVISIONAL COMMITTEE ON TERMINOLOGY, NOMENCLATURE AND SYMBOLS (ICTNS)

### Composition and Terms of Office

- (i) There shall be a standing Interdivisional Committee on Terminology, Nomenclature and Symbols, composed of a Chair, a Secretary, up to three Titular Members and up to three Associate Members as a “core” membership and one Titular Member from each Division.
- (ii) The President, in consultation with the Executive Committee, shall appoint the Titular Members and the Associate Members. ICTNS and the Division Presidents may propose names of persons suitably qualified for appointment.
- (iii) The period of service of the core Titular Members and Associate Members shall be four years, renewable for a further term of four years. The period of service for Titular Members from the Divisions shall be two years, renewable up to a total of eight years.
- (iv) The President, in consultation with the Executive Committee, shall appoint the Chair and the Secretary. ICTNS may propose candidates.
- (v) The period of service of the Chair and of the Secretary shall be four years, renewable for a further term of four years. The sum of the years of service as a Titular Member or as an Associate Member and as the Chair or the Secretary shall not exceed ten years.
- (vi) The following organizations shall be invited to attend meetings of ICTNS:
  - Bureau International des Poids et Mesures
  - International Organization for Standardization
  - International Union of Biochemistry and Molecular Biology
  - International Union of Crystallography
  - International Union of Nutritional Sciences
  - International Union of Pharmacology
  - International Union of Pure and Applied Physics

### Terms of Reference

- (i) To be responsible for submission to the Bureau/Council, in accordance with Bylaw 2.1.1, for publication or otherwise, any IUPAC document concerned with terminology, nomenclature, symbols, and other conventions.
- (ii) Before recommending any material for publication as an IUPAC document, to ensure that full consultations have taken place, and the widest possible consensus has been reached among all Divisions and other bodies of the Union, and between IUPAC and other ICSU bodies, the international standardizing organizations, and Conférence Générale des Poids et Mesures (CGPM) and its Committees.

- (iii) To ensure, via each Division's Titular Member on ICTNS, that all documents for publication emanating from that Division have been subject to a satisfactory level of review of substantive material by the Division Committee.
- (iv) To ensure that any considered IUPAC view shall carry the fullest possible weight among other international organizations, all negotiations on matters concerned with nomenclature and symbols with other ICSU bodies, with the international standardizing organizations, and with CGPM and its Committees, shall be conducted through ICTNS, which shall advise the Executive Committee accordingly.
- (v) To be responsible, after consultation with all relevant bodies of IUPAC, for the official IUPAC comments on all documents on nomenclature, symbols, terminology and conventions sent to the Union for comment.
- (vi) To advise the President and the Executive Committee on suitable persons for appointment as representatives of IUPAC on other bodies concerned with nomenclature, symbols, and terminology.

## PROJECT COMMITTEE (PC)

### Composition and Terms of Office

- (i) There shall be a Project Committee composed of a Chair and five Elected Members of the Bureau. In addition, the Vice President shall be an *ex officio* voting member.
- (ii) The President, in consultation with the Executive Committee, shall appoint the members.
- (iii) The Chair shall not be a member of any other IUPAC body.
- (iv) The period of service of the Chair and members shall be two years.
- (v) The Chair shall not serve for more than six years.
- (vi) The Executive Director, or designee, shall act as Secretary for the Committee.

### Terms of Reference

- (i) To make funding decisions on interdivisional projects.
- (ii) To make funding decisions on projects judged to be too large for the financial resources of a Division or Standing Committee.
- (iii) To make funding decisions on projects from Standing Committees that does not have project budgets.
- (iv) To recommend projects for submission for external funding.
- (v) To operate within the project budget determined by the Treasurer and approved by the Council and to keep the Treasurer informed of its actions.
- (vi) To act in a timely fashion on approval requests so project schedules can be met.
- (vii) To make funding decisions on support for Conferences in Developing Countries and for Conferences on New Directions in Chemistry.

## **EVALUATION COMMITTEE (EvC)**

### **Composition and Terms of Office**

- (i) There shall be an Evaluation Committee composed of five Members of the Bureau.
- (ii) The President, in consultation with the Executive Committee, shall appoint the members and designate one of them as Chair.
- (iii) The period of service of the members shall be two years.
- (iv) The Executive Director shall act as Secretary for the Committee.

### **Terms of Reference**

- (i) To monitor statistical data on the nature and breadth of project portfolio and the geographical spread of Task Group participation.
- (ii) To examine project completion reports, identify lessons to be learned, and liaise with the Project Committee.
- (iii) To collect and analyze reports from Task Group Chairs, Divisions, and Committees on responses to strategic initiatives of the Union.
- (iv) To evaluate the roles and contributions of Divisions and Committees with respect to the mission and strategic initiatives of the Union.
- (v) To report to the Bureau, in writing, annually on the results of the evaluations done.
- (vi) To inform, after discussion in the Bureau, the National Adhering Organizations of the completed evaluations.

## CHEMRAWN COMMITTEE (CHEMICAL RESEARCH APPLIED TO WORLD NEEDS)

### Composition and Terms of Office

- (i) There shall be a standing CHEMRAWN Committee, composed of a Chair, a Secretary, six Titular Members, up to six Associate Members and up to ten National Representatives. In addition, the Treasurer shall be an *ex officio* Member, but without voting power.
- (ii) The President, in consultation with the Executive Committee, shall appoint the Titular Members and the Associate Members. The CHEMRAWN Committee may propose names of persons suitably qualified for appointment and should conduct elections, according to the pattern for Divisions, in order to inform the advice that they give to the President.
- (iii) The period of service of a Titular Member and of an Associate Member shall be four years, renewable for a further term of four years.
- (vi) The Membership shall be reviewed every two years by the incoming President in consultation with the Executive Committee.
- (v) The President, in consultation with the Executive Committee, shall appoint the Chair and the Secretary. The CHEMRAWN Committee may propose candidates.
- (vi) The period of service of the Chair and of the Secretary shall not exceed eight years. The sum of the years of service as a Titular Member or an Associate Member and as the Chair or the Secretary shall not exceed ten years.

### Terms of Reference

On behalf of the President and the Executive Committee:

- (i) To identify human needs amenable to solution through chemistry with particular attention to those areas of global or multinational interest.
- (ii) To serve as an international body and forum for the gathering, discussion, advancement, and dissemination of chemical knowledge deemed useful for the improvement of humans and their environment.
- (iii) To serve as an international, nongovernmental source of advice for the benefit of governments and international agencies with respect to chemistry and its application to world needs, and to be responsible for organizing IUPAC activities in these areas as approved by the President and the Executive Committee. The Treasurer is to be kept informed through plans, budgets, and audited accounts of activities that have financial implications. Payments from IUPAC funds must be approved by the Treasurer.

## **COMMITTEE ON CHEMISTRY EDUCATION (CCE)**

### **Composition and Terms of Office**

- (i) There shall be a standing Committee on Chemistry Education (CCE), composed of a Chair, a Secretary, six other Titular Members, and an Associate Member from each of the Divisions. Each Adhering Organization not represented among the Titular and Associate Members may nominate a National Representative to the CCE.
- (ii) The President, in consultation with the Executive Committee, shall appoint the Chair, Secretary, and Titular Members. The CCE may propose names of persons suitably qualified for appointment and should conduct elections, according to the pattern for Divisions, in order to inform the advice that they give to the President.
- (iii) The Associate Members shall be nominated by the relevant Division President from the Titular Members of the Division Committee, and be appointed by the President of the Union, in consultation with the Executive Committee.
- (iv) The period of service of Titular Members shall be four years, renewable for a further term of four years. The period of service of Associate Members shall be two years, renewable to a total period of eight years. The period of service of National Representatives shall be two years, subject to re-nomination and reappointment to a maximum period of service of twelve years.
- (v) The sum of the years of service as a Titular Member and as the Chair or the Secretary shall not exceed ten years.

### **Terms of Reference**

- (i) To advise the President and the Executive Committee on matters relating to chemistry education, including the public appreciation of chemistry.
- (ii) To maintain a portfolio of educational projects and to coordinate the educational activities of IUPAC.
- (iii) To monitor chemistry education activities throughout the world and to disseminate information relating to chemical education, including the public appreciation of chemistry.
- (v) To develop liaisons with international organizations such as UNESCO, national and regional chemical societies, chemical education committees, and organizations concerned with the public appreciation of science.

## COMMITTEE ON CHEMISTRY AND INDUSTRY (COCI)

### Composition and Terms of Office

- (i) There shall be a standing Committee on Chemistry and Industry, composed of a Chair, a Secretary, six other Titular Members and up to six Associate Members. In addition, each NAO representing a country having more than one Company Associate may propose a National Representative to COCI. By mutual agreement, two or more NAOs in a given geographic region that has more than three Company Associates may jointly propose a National Representative from that region.
- (ii) The President, in consultation with the Executive Committee, shall appoint the Chair, the Secretary, the Members and the National Representatives. The President may, at his/her option, designate one of the Titular Members as Vice-Chair. Candidates may be proposed by the Committee on Chemistry and Industry, by National Adhering Organizations having Company Associate programs, or by Company Associates. The Committee should conduct elections, according to the pattern for Divisions, in order to inform the advice that they give to the President.
- (iii) The period of service for all categories of Members and National Representatives shall be four years, renewable for a further term of four years, subject to (iv), below.
- (iv) The Membership shall be reviewed every two years by the incoming President, in consultation with the Executive Committee.
- (v) The sum of the years of service as a Member and as the Chair or the Secretary shall not exceed ten years.

### Terms of Reference

- (i) To advise the President and Executive Committee of the potential impact on IUPAC programs of trends and developments in the international chemical industries, including pharmaceutical, agrochemical and related industries. Also, to advise on options and actions by which IUPAC could become more attractive to increased participation by scientists in industry.
- (ii) In collaboration with National Adhering Organizations, to develop and maintain an active program to recruit, guide and inform Company Associates on IUPAC programs and policies. To convey to IUPAC management at all levels relevant information from Company Associates that may assist in developing IUPAC programs and projects.
- (iii) To develop liaisons with (a) national and international associations that represent industries based on the chemical sciences; (b) national and regional chemical societies; and (c) international bodies such as UNESCO and UNIDO.
- (iv) In cooperation with other IUPAC bodies, to initiate and maintain a portfolio of projects with implications for industry and to help develop good relations between IUPAC and industry. To advise IUPAC bodies on the potential for participation and/or funding of relevant projects by industry and to coordinate overtures to industry on such funding.

## **INTERDIVISIONAL COMMITTEE ON GREEN CHEMISTRY FOR SUSTAINABLE DEVELOPMENT (ICGCSD)**

### **Composition and Terms of Office**

- (i) There shall be a standing Interdivisional Committee on Green Chemistry for Sustainable Development, composed of a Chair, a Secretary, up to three Titular Members and up to three Associate Members as a “core” membership and one Representative Member from each interested Division and Standing Committee.
- (ii) The President, in consultation with the Executive Committee, shall appoint the Chair, Secretary, Titular Members, and Associate Members. The ICGCSD, Division Presidents and Standing Committee Chairs may propose names of persons suitably qualified for appointment and should conduct elections, according to the pattern for Divisions, in order to inform the advice that they give to the President.
- (iii) The period of service of Titular Members and Associate Members shall be two years, renewable for a further term of two years. The period of service of Representatives from the Divisions and Standing Committees shall be two years, subject to re-nomination and reappointment to a maximum period of service of eight years.
- (iv) The period of service of the Chair and of the Secretary shall be two years, renewable for a further two years. The sum of the years of service as a Titular Member or Associate Member and as the Chair or the Secretary shall not exceed ten years.
- (v) The following organizations shall be invited to attend meetings of ICGCSD:  
 United Nations Educational, Scientific Cultural Organization (UNESCO)  
 International Council for Science Unions (ICSU)  
 Organization for the Prevention of Chemical Weapons (OPCW)  
 Strategic Approach to International Chemicals Management (SAICM)  
 United Nations Industrial Development Organization (UNIDO)  
 International Council of Chemical Associations (ICCA)  
 Organization for Economic Co-operation and Development (OECD)

### **Terms of Reference**

- (i) To be responsible for advancing the strategic plan of the Union for green and sustainable chemistry and for coordination of all the work of the Union in this area to develop a coherent program of action.
- (ii) To initiate and coordinate projects in green and sustainable chemistry and to encourage activities in these areas from across the Divisions and Standing Committees.
- (iii) To organize the series of IUPAC International Conferences on Green Chemistry and manage IUPAC participation in the PhosAgro/UNESCO/IUPAC Green Chemistry for Life awards program and the IUPAC Prize in Atmospheric and Green Chemistry and any other related awards that may be established.
- (iv) To also seek additional sponsorship and support from industrial sources for its work.
- (v) To work actively with COCI and CCE to stimulate and increase interest in green and sustainable chemistry in the theory and practice of industrial chemistry and chemistry education, through their external industrial and institutional relationships.
- (vi) To listen to and be aware of the external industrial and institutional perspectives and priorities.
- (vii) To be responsible, after consultation with all the relevant bodies of IUPAC, for advice to the President and Executive Committee on matters relating to harmonization, regulation and standardization in green and sustainable chemistry.

- (viii) To be responsible for the promulgation of the work of the Union in green and sustainable chemistry through interaction with other relevant organizations with a common interest.
- (ix) To ensure that any considered IUPAC view on Green Chemistry shall carry the fullest possible weight among other international organizations and to advise the Executive Committee as to our standing in these matters.
- (x) To advise the President and the Executive Committee on suitable persons for appointment as Representatives of IUPAC on other bodies concerned with green chemistry for Sustainable Development Goals.