

# IUPAC Organic and Biomolecular Division III

Reports to Bureau 2020 (April 25)

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## **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 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 2018-2019 biennium Division III endorsed 17 international Conferences that are part of a longstanding series (see detail below). Similar intensive schedule was planned for 2020, but it will be modified depending from the dynamics of coronavirus epidemic.

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. In particular, the 2018 prize was attributed to Professor Seth Herzon (Yale University, CT, USA) has been presented at the ICOS22 in Florence for his research focused on chemistry of natural products with emphasis on the synthesis and study of DNA-damaging natural products, human microbiota, metabolites and antibiotics.

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 is planned that the prize should be presented at the ICOS-23 (to be held in Shanghai, China; October 18-23) followed by Thieme–IUPAC lecture to be delivered by awardee. 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-nl&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-nl&utm_medium=email&utm_content=20k5c2_20o1bv_20ord5)

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. They include:

- ✓ Subcommittee on Organic Synthesis
- ✓ Subcommittee on Biomolecular Chemistry
- ✓ Subcommittee on Photochemistry
- ✓ Subcommittee on Structural and Mechanistic Organic Chemistry
- ✓ Subcommittee on Biotechnology

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 meet annually, either at the most relevant scientific conference or at the biannual General Assembly.

### **III. An overall report of Division/Committee activities and achievements during 2018-2019 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 2018-2019, the Division oversaw arrangements for 11 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.

Details of Division conferences of 2018-2019 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. As examples two paper collections can be named – first one was published in 2019 in relation to 29<sup>th</sup> International Carbohydrate Symposium (Lisbon, Portugal), while second is going to be published in 2020 and is dedicated to 21<sup>st</sup> Mendeleev Congress (Saint Petersburg, Russian Federation).

The Division oversees the awarding of Thieme-IUPAC prizes to outstanding young chemists (see above).

#### **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).

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.

### **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).

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); c)

International Workshop on the Impact of Scientific Developments on the Chemical Weapons Convention (2017-001-14); d) endorsement of the 25<sup>th</sup> Meeting of Croatian Chemists and Chemical Engineers April 9<sup>th</sup> to April 12<sup>th</sup>, 2019, Šibenik, Croatia; e) The XXIst Mendeleev Congress on General and Applied Chemistry of the Mendeleev Russian Chemical Society (September 09-13, 2019 in St. Petersburg, Russia) which included special sessions and satellite event dedicated to chemical education.

### **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)	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>  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> - <b>dates can be rescheduled</b>
International Symposium on the Chemistry of Natural Products (ISCNP) and International Conference on Biodiversity (ICOB)	ISCNP30 & ICOB10 Athens, Greece, 25-29 November 2018, <a href="https://www.iscnp30-icob10.org/">https://www.iscnp30-icob10.org/</a>  ISCNP31 & 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>

International Symposium on BioOrganic Chemistry (ISBOC)	ISBOC-12, December 15-18th, 2019, ShenZhen, China. ISBOC-13, October 23-26, 2021, Singapore. It will be organized by Professor Bengang Xing of Nanyang Polytechnic University
International Carbohydrate Symposium (ICS)	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> 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> ICS-2022, Florianópolis, Brazil, 10-14 July 2022.
International Biotechnology Symposium (IBS)	18 <sup>th</sup> IBS, Montreal, Canada, 12-17 August 2018, <a href="http://www.ibs2018.org">http://www.ibs2018.org</a> 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 May 2021</b>
International Conference on Physical Organic Chemistry (ICPOC)	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> 25 <sup>th</sup> ICPOC, Hiroshima, Japan, 5-10 July 2020, <a href="https://icpoc25.jp/">https://icpoc25.jp/</a> - <b>congress postponed until 2022</b>
International Conference on Phosphorus Chemistry (ICPC)	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> 23 <sup>rd</sup> ICPC, Ningbo, China, May 31 – June 04, 2020, <a href="http://www.icpc23.org/">http://www.icpc23.org/</a> - <b>postponed and will be rescheduled</b>
IUPAC International Symposium on Photochemistry (PhotoIUPAC)	27 <sup>th</sup> , Dublin, Ireland, July 8-13, 2018 <a href="http://photoiupac2018.com/">http://photoiupac2018.com/</a> 28 <sup>th</sup> , Amsterdam, Netherlands, 12-17 July 2020 <a href="https://photoiupac2020.amsterdam/">https://photoiupac2020.amsterdam/</a> <b>postponed and will be rescheduled</b>

**Division III members organized conferences which had previously (before 2019) the endorsement by IUPAC**

International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS)	20 <sup>th</sup> OMCOS, Heidelberg, Germany, July 21-25, 2019. <a href="https://www.omcos2019.de/">https://www.omcos2019.de/</a> 21 <sup>st</sup> OMCOS, Vancouver, Canada, July 25-29, 2021. <a href="https://omcos2021.ca/">https://omcos2021.ca/</a>
International Conference on Heteroatom Chemistry (ICHAC)	13 <sup>th</sup> ICHAC, Prague, Czech Republic, <a href="http://www.ichac2019.com/">http://www.ichac2019.com/</a>

	14 <sup>th</sup> ICHAC
International Symposium on Novel Aromatic Compounds (ISNA)	18 <sup>th</sup> ISNA, July 2019, Sapporo, Japan 19 <sup>th</sup> ISNA
Chemistry Conference for Young Scientists	15 <sup>th</sup> ChemCYS, February 2018, Blankenberge, Belgium 15 <sup>th</sup> ChemCYS
Polymers and Organic Chemistry (POC)	17 <sup>th</sup> POC, June 2018, Montpellier, France 18 <sup>th</sup> POC
Mendeleev Congress on General and Applied Chemistry	21 <sup>st</sup> Mendeleev Congress, Saint Petersburg, Russian Federation, 9 – 13 September 2019 22 <sup>nd</sup> Mendeleev Congress
International Symposium on Glycoconjugates (GLYCO)	GLYCO25, Milano, Italy, 25-31 August 2019 GLYCO26, Taipei, Taiwan, August 29 – September 3, 2021, <a href="http://glyco26.org/">http://glyco26.org/</a>
Eurasia Conference on Chemical Sciences	EuAsC2S-15, Rome, Italy, 5-8 September 2018

## PROJECTS

<b>Projects completed during the 2018-2019 biennium</b>	Proposed by Div.III	Supported by Div.III
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 2019 and 2020-2021 biennium</b>	Proposed by Div.III	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 # 2019-046-1 (BAI), under step 4 of review.	X	

<b>Project proposals during the 2018-2019 biennium</b>	Proposed by Div.III	Supported by Div.III
BRIDGING ETHNIC FOOD CULTURES THROUGH CHEMISTRY	X	

(#2017-037-2), Rauter, approved in January 2019		
BUILDING BROADER AND DEEPER LINKS BETWEEN OPCW AND IUPAC (#2018-022-3-020)		X
INTERNATIONAL YEAR OF THE PERIODIC TABLE OF CHEMICAL ELEMENTS (IYPT) IN 2019: PLANNING, COORDINATION AND IMPLEMENTATION (#2018-005-2-020)		X
METRICES FOR GREEN CHEMISTRY (#2017-030-2-041), Tundo	X	

<b>Projects previously approved that remain current</b>		
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	

## IUPAC Strategic Plan 2015

### VISION

IUPAC is an indispensable worldwide resource for chemistry.

### MISSION

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.

IUPAC accomplishes its mission by fostering sustainable development, providing a common language for chemistry, and advocating the free exchange of scientific information.

### CORE VALUES

We serve humankind by advancing chemistry worldwide.

- Scientific excellence and objectivity are the cornerstones of all our work.
- We value collaboration and communication among all our stakeholders.
- We strive for diversity and inclusiveness in all forms.
- We respect each other and the Union.
- We uphold the highest standards of transparent, responsible and ethical behavior.

### GOALS (short term and long term)

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.

### OBJECTIVES (short term – substantial progress in coming biennium)

Brand IUPAC in the minds of stakeholders

Improve quality and frequency of communication with stakeholders

Increase revenue

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

