

# IUPAC COMMITTEE ON CHEMISTRY EDUCATION

## Meeting at the 47th General Assembly IUPAC Istanbul, Turkey

Meeting times:

*Sunday August 11, 09.00 - 12.30 and 14:00-17:30 joint lunch*

*Meeting location Harbiye Military Museum Kocatepe*

*Monday August 12. 09.00 -12.30*

*Meeting location Harbiye Military Museum Inonu*

09.00	<b>1. Welcome, introduction and orientation (45')</b> <b>In memoriam</b> <b>Erica Steenberg</b> <b>Krishna Sane</b>  Attendees: Introductions Mustafa Ozbilir ZSuai, NR China, Ron, Christine , Ministry, Rachel Memlok, Nina Aremo, Athens div. chem environment, Vincence observer from UK, Young observer, Ilka Parchmann, Felix, Marja Elmgren, Peter Childs, Ire, Peter Mahaffy, Can, Eva Akesson, TM, Mary Garson org, chemistry, Susan Boniface, NR New Zealand, Div 6, young observer, Malaysia, Kamata, TM, Choon Do, TM Korea, ILja Jose, young observe. Tony Wright NR Australia, Christina Reiner, NR Germany, lady from Asian chemical society, Javier Garcia, spain div. 2, Richard Hawthorne, div 8. Chines chemical society (divi 5) senior observer Tue King Soon will come later. Liberato Cardellini arrives 10.10
09.45	<b>2. Decision on agenda (5')</b> agreed
09.50	<b>3. Minutes of CCE- meeting in ROME July 2012[CCE2013_3] (10')</b> minutes were passed
10.00	<b>4. Matters arising from the minutes of CCE and new Business (10')</b> No new matters arose from the minutes
10.10	<b>5. Chair's Report to Council, April 2013 [CCE2013_005] (15')</b> Mei Hung Chiu see powerpoint of Mei Hung (Attachement 1) Rachel Memlok rearks that a framework for evaluation of outcome might be made of projects. Perhaps a survey. She suggetst to document the success of projects a bit more. MH several success reports have been made for YAC.
10.25	<b>6. Future directions for CCE – priorities for 2012-2013 (20')</b> Christine Strout, young observer asked about committee priorities, Mei Hung explains a little about the procedure. Time scale of priorities at least a year ahead.

	<p>Ng Soo Boon. How are projects, like flying chemists program or YAC financed? The local organization needs to pay for all local cost accommodation and day expenditure. CCE only pays for flight tickets. So people need partners. Ownership goes to local organizers.</p> <p>Peter Mahaffy emphasizes ownership of the program of local organizers..</p> <p><b>Biennial goals</b> are discussed (Mei-Hung Chiu) [CCE2013_006] the goals are projected on the screen.</p> <p>What actions can we take? We have projects, any other things we can do? Suggestions are made by several people. The CCE should cooperate with other organizations, Like COCI for example. The awareness of chemical education should be stressed. This is a world wide problem. Chemistry needs to be promoted. We should work together with other disciplines to demonstrate the importance of chemistry. What are we doing to stimulate inquiry based education?</p> <p>It is stressed that we need to communicate what we do. We need to decrease the fear of chemicals, even though chemicals can be dangerous. The OPCW project is an example of such a project. It is stressed that the CCE should not only work within IUPAC, but also with other organizations.</p> <p>General idea that chemistry needs to be promoted.</p> <p>TM: Nina Aremo CCE website</p> <p>The website is messy. Contact about the website goes through Bryan Pearson of the bureau. IUPAC is rearranging the website. She demonstrates the current website. She will work with Bryan to make a new page. She has made a proposal for first page. (see attachment 2)</p> <p>Christine Strout and Mark are working on website for the bureau.</p> <p>Christine indicates anything is possible. They need to know what committee wants. Nina. It needs to be under IUPAC, but access and input to people from committees and divisions. Several suggestions are made. It is stressed that the site should be part of IUPAC. The website is important as a means of communication.</p> <p>Rachel Memlok indicates that for example the Flying Chemist Program needs a place for report and survey, Putting this on the website should be part of the procedure</p> <p>Current president Mark Cessa drops by in the meeting.</p> <p>He stresses the need to publish in IUPAC journals. The website is primarily for information.</p> <p>.</p>
10.45	<b>Coffee break</b>
11.15	<p><b>7. Report from Projects group (Mustafa Sözbilir) [CCE2013_007] (30')</b></p> <p>The report was in the agenda.</p> <p>Mustafa gave some extra information and discussed the report.</p> <p>Discussion: Mei Hung: The extra money in the projects is not much, but it does help, and it is a token of appreciation. In some cases IUPAC also gives some money.</p> <p>Projects receiving grants should be in line with the 6 CCE biannual priorities.</p>

	<p>7.1.Membership,  7.2.Review procedure  7.3. Project Budget  7.4.Completed projects  7.5.Current Projects  7.6.Projects under consideration  7.7.Future projects</p>
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11:45	<p><b>8. Interaction with Divisions and Standing Committees</b>  <b>8.1</b> Report from Divisional Liaison Officer (Mei Hung Chiu, Jan Apotheker)  Mei Hung Chiu and Jan Apotheker visited the division meetings. During the meetings the subject that was discussed was how the CCE could interact with the divisions. There are several projects running in which the CCE cooperates with divisions. An example is the periodic table of isotopes.  One major discussion point has been and still is the definition of the mole and the kilogram. There are two proposals running on this subject. A decision was taken at the IUPAC meeting in San Juan, but a number of people wish to reconsider that discussion. Some educational issues play a role. Especially the problem of linking the kilogram to Planck's constant is an issue. We decide we will send a representative to a committee consisting of participants from relevant divisions, that will prepare a proposal for the 2015 IUPAC meeting.   Choon Do. During this meeting elements 114, 116 will receive names? Three or two more will be named by IUPAC.  CCE could initiate a competition to ask people to suggest new element names. Some elements already have some indications. But the names from the competition might be used in the future.</p>
12:30	<b>LUNCH + group photograph (appendix 3)</b>
13:30	<p><b>8.2.</b> Contributions from Divisional Representatives and standing committee chairs  Division 2, inorganic chemistry  Javier: Table of isotopes project Peter Mahaffy is involved on behalf of the CCE: An interactive table of the isotopes has been created. Click on element, show the isotopes, show extra information about the use of a particular isotope. Create interactive learning tool, related to mass spectroscopy. Than better understanding of atomic weight. Proposal will come shortly. There will be website.  Javier: Unesco, a Russian company ASCRO, IUPAC: have 1.4 million euro</p>

	<p>for green chemistry. IUPAC will be involved to determine who will receive grants. Javier will play a role in educational aspects. IUPAC will give an award to five students. They need more applications. Please advertise. The book by Javier: 'Chemical Education' should be ready in Toronto.</p> <p>Werner Mormann: division 4 polymer (see appendix 4) For interaction with division 4 new member of CCE is needed.</p> <p>Break for lunch.</p> <p>Norman Holden, coordinator of the project for the periodic table for the isotopes. Described the table. Work on focus group they participated and looked at table. <a href="http://www.kcvs.ca/nonpublic/interactivePeriodicTableIUPAC/PeriodicTable.swf">www.kcvs.ca/nonpublic/interactivePeriodicTableIUPAC/PeriodicTable.swf</a> See appendix 5 and Article in CI: Vol. 33 No. 4 July-August 2011.</p> <p>Paul le Bièvre discussed the new definition of the SI units mole/kg The definition of the kg must be taught in secondary education. But that is a challenge. Definition of the mole as a unit which is the property is also problematic. Property 'amount of substance' remains a problem. The CCE was asked if they could come up with an idea. The 1971 definition mole is based on 'continuous matter' (not quantized)</p> <p>IliA Guzei asked for attention to the Year of chromatography, see attachment 6.</p> <p>Richard Hawthorne, division 8. Nomenclature A new book about organic nomenclature (blue) will be published shortly. Also basic guides about nomenclature organic and inorganic chemistry will be published. Any feedback from CCE on these guides will be appreciated. Question Madeleine Schulz: will it be available on line? Most likely not.</p>
14:00 in between teabreak	<p><b>9. Review of activities and relationships</b></p> <p><b>9.1.</b> OPCW activities Peter Mahaffy discussed the updating, piloting, and disseminating of educational material for raising awareness of the multiple uses of chemicals and the Chemical Weapons Convention. They will give a workshop later during the conference. The material can be found at the following url: <a href="http://www.kcvs.ca/nonpublic/multipleuses2013">www.kcvs.ca/nonpublic/multipleuses2013</a> It is a cooperation between iupac and opcw</p> <p><b>9.2.</b> Flying Chemists (Educator) Program (FCP) (Mei-Hung Chiu. Ting Kueh Soon) Early 2014 the program will go to Cambodia and Thailand. Some funds will be raised. Sometime April 2014 the format has been changed a little. By adapting this proposal to change name in FCEP. Everybody agrees to the new name.</p>



	<p><b>9.3.</b> YAC Program (Mei-Hung Chiu), YAC in 2013/2014 (Ting Kueh Soon, Supawan Tantayanon)</p> <p>Tea break</p> <p><b>9.4.</b> Relationship with EuCHEMS, ECRICE (Ilka Parchmann)  Ilka Parchmann introduces Division of Chemical Education. The division overlaps somewhat with CCE. Division has no budget, no projects. It organizes conferences like the ECRICE and Eurovariety. The division was very satisfied with conference in Rome. In Berlin we could have a second common conference in 2018.  2014 Finland ECRICE Jyvaskala.  2015 Eurovariety in Estonia.  2016  Further activities in ECTN for teacher education. An Echemtest is worked on for chemistry education.</p> <p><b>9.5.</b> Best practices in the use of learning outcomes in chemistry education: Maja Elmgren</p> <p>see ppt in attachment 7  Ilka Parchmann thanks organizers of the workshop. The process in the workshop is the product itself.  Peter Mahaffy suggests to involve emerging countries.  Malaysia would like to contribute / partake in the workshop. A workshop will be held in Toronto.</p> <p><b>9.6.</b> Design for International Standards for Chemistry Education (ISCE) by, Mei Hung Chiu</p> <p>see attachment 8  Positive reactions from people attending.</p> <p><b>9.7.</b> Joint Project with division IV: Choon Do will report later.</p> <p><b>9.8.</b> Future activities  The CCE will participate in the committee about the definition of the kg and the mole</p>
16:30	<p><b>10. Reports from NRs and TMs</b>  Questions only based on written reports. Reports received from China, Finland, Germany, Ireland, Italy, Japan, Malaysia, Netherlands, Taiwan, USA, UK</p>
17:00	Table until next day
17:00	<b>Opening ceremony</b>
19:30	Dinner at: <a href="http://www.ulusafe.com">http://www.ulusafe.com</a> , at your own expense. This is about 15 minutes away from the venue by taxi. We will travel together from the reception at 18:30. Wonderful place to have dinner with a fantastic view.

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*Meeting location Harbiye Military Museum Inonu*

09.00	Reopening meeting
09.05	<p><b>11. ICCE programme (Morton Hoffman) (CCE2013-011)</b></p> <p><b>11.1.</b> Report from ICCE/ECRICE Rome 2012 has been done already at the end of the Rome conference and was in minutes</p> <p><b>11.2.</b> Overview from Toronto, 23rd ICCE in 2014 (Andrew Dicks and Judith Poe) see attachment 9 for overview Plenary lectures gender was balanced to 1 female rest male Registration fee will be: \$ 500 Depends on fund raising Hotels will be listed. There will be a link. See hotwire.com Invitation letters for visa are needed</p> <p><b>11.3.</b> Bid from Malaysia, 24th ICCE in 2016 (Ting Kueh Soon) (CCE2013_11.3) date for the conference: early July people from closeby countries they will come to this conference. Positive reaction from Russia Nice temperature Security very safe like any other city</p> <p><b>11.4.</b> Bid from Australia, 24th ICCE in 2016 (Siegbert Schmidt) (CCE2013_11.4) questions: will Australia and Malaysia reapply again? Australia: we will reapply later in principle, but situation will be different. Malaysia: not certain. Registration fee: IUPAC members/ delegates depends on grants. Dinners not included.</p> <p><b>11.5.</b> Vote and decision on venue 2016 Malaysia won the vote. The ICCE will be held in 2016 in Kuchang.</p> <p><b>11.6.</b> Considerations for 2016 and beyond (Morton Hoffman) Berlin is indicated as a possible venue in 2018, again in combination with ECRICE</p>
10.30	Coffee break between 11.5 and 11.6
10.45	<p><b>12. Administrative matters (Mei-Hung Chiu)</b></p> <p><b>12.1.</b> Finance Project budget Operating budget budget report from Mei Hung see attachment 10 The whole budget is finished and used for projects.</p> <p><b>12.2.</b> Results electronic voting,</p>

	<p>The committee new TM's has postponed the election till later.</p> <p><b>12.2.1.</b> TM appointments has been postponed</p> <p><b>12.2.2.</b> Process for approval of conference coordinator, project group chair has been postponed</p> <p><b>12.2.3.</b> Report on NR and AM appointments</p> <p><b>12.2.4.</b> Acknowledgment to members whose terms expire, Eva Åkesson, Choon Do are stepping down, Mei Hung presented nice plaques to both of them.</p> <p><b>12.2.5.</b> Logo of CCE. We would like to have a logo for the CCE. We would like to have a context with a small prize (\$ 100) for the winning design. Mei-Hung Chiu, Jan Apotheker.</p> <p><b>12.2.6.</b> CCE-certificate. We would like to issue CCE-certificates for attending CCE meetings. After 5 meetings, 10 meetings 15 meetings a special certificate will be granted. Mei-Hung Chiu, Jan Apotheker</p>
12.15	<p><b>Next meetings:</b></p> <p>2014: Toronto</p> <p>2015: Busan, Korea</p> <p>2016: Kuchang, Malaysia</p> <p>2017: Sao Paolo, Brazil</p> <p>2018: perhaps Berlin</p>
12:20	<p>Any other business</p> <p>Peter Childs: How do we involve more countries?</p> <p>We discussed this: We will write to NAO's to ask for representative in CCE. In report to the council this will be mentioned.</p>
12:30	Closing of meeting at 12.40

## Expected attendants

Name	country	status	Will attend	Right to vote	email
Chiu, Mei-Hung	Taiwan	Chair TM	yes	X	Mei-Hung Chiu <mhchiu@ntnu.edu.tw>
Apotheker, Jan	Netherlands	Secretary, TM	yes	X	j.h.apotheker@rug.nl
Akesson, Eva	Sweden	TM	yes		"Eva Akesson(Sweden)" <eva.akesson@rektor.lu.se>
Aremo, Nina	Finland	TM	yes	X	"Nina Aremo (Finland)" <nina.aremo@helsinki.fi>
Do, Choon	Korea	TM	yes	X	"Choon Do (Korea)" <choondo@sunchon.ac.kr>
Kamata, Masahiro	Japan	TM	yes	X	Masahiro Kamata <masahirok@nifty.com>
Sözbilir, Mustafa	Turkey	TM	yes	X	Mustafa Sözbilir <sozbilir@atauni.edu.tr>
Michael Dröscher	Ex officio Germany	AM			Michael Dröscher <m.droescher@t-online.de>
John Dufus	Chemistry and human health division	AM		X	
Assaf Friedler	Physical and Biophysical Chemistry division	AM		X	
Javier Garcia-Martinez	Inorganic Chemistry division	AM		X	Javier Garcia Martinez <j.garcia@ua.es>
Hemda Garelick	Chemistry and environment division	AM		X	Hemda Garelick <H.Garelick@mdx.ac.uk>
Mary Garson	Organic and biomolecular division	AM	yes	X	Mary Garson <m.garson@uq.edu.au>
Richard Hartshorn	Chemical Nomenclature and structure division	AM	yes	X	Richard Hartshorn <richard.hartshorn@cantebury.ac.nz>
Werner Mormann	Polymer division	AM		X	
Abdulaziz Al-Najjar	Kuwait	NR		X	anajjar55@hotmail.com

Boesch, Philippe	Switzerland	NR		X	"Philippe Boesch (Switzerland)" <pboesch@iprolink.ch>
Boniface, Suzanne	New Zealand	NR	yes	X	"Suzanne Boniface(New Zealand) "" <suzanne.boniface@vuw.ac.nz>
Brandt, Ludo	Belgium	NR	no	X	"ludo brandt <ludo.brandt@skynet.be>
Cardellini, Liberato	Italy	NR	yes	X	"Liberato Cardellini(Italy) "" <libero@univpm.it>
Childs, Peter	Ireland	NR	yes	X	"Peter Childs(Ireland)" <peter.childs@ul.ie>
Elmgren, Maja	Sweden	NR	yes	X	"Maja Elmgren(Sweden)" <maja.elmgren@fki.uu.se>
Fahmy, Ameen	Egypt	NR		X	"AMEEN FAHMY <afmfahmy42@gmail.com>
Hoffman, Morton	USA	NR	yes	X	Morton Hoffman <hoffman@chem.bu.edu>
Mahmood, Farzana	Pakistan	NR		X	"Farzana Mahmood(Pakistan) "" <fmkl702@hotmail.com>
Maitra, Uday	India	NR		X	"Uday Maitra(India) "" <maitra@orgchem.iisc.ernet.in>
Mamlok-Naaman, Rachel	Israel	NR	yes	X	"Rachel Mamlok-Naaman(Israel) "" <rachel.mamlok@weizmann.ac.il>
Overton, Tina	UK	NR	yes	X	"Tina Overton (United Kingdom) "" <t.l.overton@hull.ac.uk>
Pokrovsky, Alexander	Russia	NR		X	"Alex Pokrovsky(Russia) "" <an.pokrovsky@wanadoo.fr>
Rahman, M. Muhibur	Bangladesh	NR		X	"M. Muhibur Rahman (Bangladesh)"" <em@univdhaka.edu>
Reiners, Christiane	Germany	NR	yes	X	"Christiane Reiners (Germany) "" <christiane.reiners@uni-koeln.de>
Riedel, Miklós	Hungary	NR	no	X	"Miklós Riedel (Hungary) "" <riedel@ludens.elte.hu>
Shuai, Zhigang	China	NR	yes	X	"Zhigang Shuai"(China/Beijing)" <zgshuai@tsinghua.edu.cn>
Solomon, Theodros	Ethiopia	NR	no	X	"Theodros Solomon (Ethiopia)"" <theodros.solomon3@gmail.com>
Soon, Ting-Kueh	Malaysia	NR	yes	X	"Ting-Kueh Soon (Malaysia) "" <soontk@ikm.org.my>
Tantayanon, Supawan	Thailand	NR	yes	X	"Supawan Tantayanon (Thailand) "" <supawan.t@chula.ac.th>
Toshev, Borislav	Bulgaria	NR		X	"Borislav Toshev(Bulgaria) "" <toshev@chem.uni-sofia.bg>
Wright,	Australia	NR		X	"Anthony (Tony) Wright

Anthony (Tony)					(Australia) "" <tony.wright@uq.edu.au>
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<b>Guests others</b>				
Ilka Parchmann	div. education Euchems		yes	Ilka Parchmann <parchmann@ipn.uni-kiel.de>
Pascal Mimero	France	EC2E2N	yes	mimero@cpe.fr
Peter Mahaffy	Canada	OPCW	yes	Peter Mahaffy <Peter.Mahaffy@kingsu.ca>
Judith Poë	Toronto	2014 ICCE chair	yes	Judith Poe <judith.poe@utoronto.ca>
Andrew Dicks	Toronto	2014 ICCE committee	yes	Andrew Dicks <adicks@chem.utoronto.ca>
Felix Ho	Sweden	Observer	yes	Uppsala University
Leontina Lazo	Chili	observer	yes	liazo@ucv.cl
Robin Macaluso	USA	Young observer	yes	<a href="mailto:Robin.Macaluso@unco.edu">Robin.Macaluso@unco.edu</a>
Ron Castellano	USA	Young observer	yes	castellano@chem.ufl.edu
Straut, Christine M	USA	Young observer	yes	cmstrau@sandia.gov
Ilia Guzie	USA	Young observer	yes	iguzei@che.wisc.edu

## Appendix 1



# Committee on Chemistry Education

## Progress report

Mei-Hung Chiu, Chair  
Istanbul, Turkey, August 11, 2013



## I. CCE mandate

- To advise the President and the Executive Committee on **matters relating to chemistry education**, including the public appreciation of chemistry.
- To **maintain a portfolio** of educational projects and to coordinate the educational activities of IUPAC.
- To monitor chemistry education activities throughout the world and to disseminate information relating to chemical education, including the **public appreciation of chemistry**.
- **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.



## II. CCE Priorities for 2012-2013 biennium

- To give priority to initiatives that **highlight the relationship between chemistry and sustainable development via working with divisions**, also to extend the goals of the IYC the UN Decade for Education for Sustainable Development.
- To maintain a primary focus on working with other **partners**, across divisions, and stakeholders to maintain momentum of the International Year of Chemistry.
- To emphasize the importance of developing ALL students' **inquiry competency** and learning outcomes of excellence in chemistry education, both in the developed and developing world.
- To identify **new** learning and teaching practice in the areas of chemistry education throughout the world.
- To build **chemistry education networks** among and outside IUPAC, using fully the multicultural capacity within CCE and chemistry to bridge people.
- To continue to support initiatives that raise **awareness, social responsibilities**, and understanding of ethical issues that are important in chemistry education.

## III. CCE Activities and partnerships

### A. **Partnership** : Collaboration with **ECRICE** (European Conference on Research in Chemical Education)

- **International Conference on Chemical Education (ICCE) was held in Rome in 2012**
- 22<sup>nd</sup> ICCE and 11<sup>th</sup> ECRICE (European Conference on Research in Chemical Education)
- 574 registered delegates from 71 countries, 624 abstracts submitted, 356 oral presentations, and 237 poster contributions presented at the conference.



## B. Partnership : Collaboration with American Chemical Society

### A Virtual Colloquium to Sustain and Celebrate IYC 2011

**Initiatives in Global Chemical Education** was a collaborative effort between the IUPAC Committee on Chemical Education (CCE) and the ACS Division of Chemical Education Committee on Computers in Chemical Education (CCCE).

Bob Belford (ACS-CCCE), Mustafa SOZBILIR (IUPAC-CCE), Fabienne Meyers (IUPAC) and Liberato Cardellini (ICCE-ECRICE) was held from May 18 - June 29, 2012.

During this time **824 people** were registered to the email list and the virtual papers received **11,616 hits and 155 comments**, and as of March 18, 2013 the number of hits has grown to **30,893**.

## C. Partnership with Latin America:

Launching 2 CCE's projects (YAC and FCP)

- Panama City, Panama (university of Panama and Ministry of Education)
- Cancun, Mexico (At the Congreso Latinoamericano de Quimica (CLAQ 2012
- *Flying Chemists Program* (FCP)
- *Young Ambassadors for Chemistry* (YAC)



## YAC aiming to promote teachers, students, and public understanding of chemistry



(Ministry of Education, Panama)

## YAC and FCP in Cancun, Mexico



## Young Ambassadors for Chemistry (YACs)

has been conducted in 12 countries.



2004, Taipei, Taiwan  
 2005, Argentina  
 2005, Krasnojarsk, Russia  
 2006, Gwangju, Korea  
 2007, Grahamstown, South Africa  
 2008, Réduit, Mauritius  
 2009, Nicosia, Cyprus  
 2010, Ipoh, Malaysia  
 2010, Manila, Philippines  
 2010, Taipei, Taiwan  
 2011, Ethiopia  
 2011, Puerto Rico  
 2012, Tanzania  
 2012 Mexico and Panama



## IUPAC CCE's Young Ambassadors for Chemistry (YACs)

---Lida Schoen, Mei-Hung Chiu, Erica, Steenberg





# Flying Chemists Program (FCP)

- FCP will generally be implemented in economically disadvantaged countries. The host country will provide boarding and lodging for the FCP experts, and CCE will provide the airfare. Visits will be considered only if invitations are received from a national society, a ministry of education or technology, or other comparable organization.
- **Initiated by Peter Atkins in 2005**
- 2005 Sri Lanka
- 2006 India



## **Mei-Hung Chiu (2006-2013)**

- 2008 Philippines
- 2010 Croatia
- 2011 Ethiopia
- 2012 Panama & Mexico
- (2013-2014) Cambodia and Thailand

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## FCP is intended to:

- Assist in the development of **curricula**
- Help develop or recommend new **assessment** tools
- Help develop different approaches to the teaching of chemistry, including **hand-on experiences**
- Help develop and implement teacher training and preparation programs
- Assist in the **establishment of partnerships** among universities, industries, and governments
- Develop **successful international conferences** to gain expert advice on a particular aspect of chemistry education
- **Help identify and approach sources of funding**



The Philippines  
(2008)



Croatia  
(2010)



Ethiopia  
(2011)

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## D. Croatia-Follow up Flying Chemists Program (FCP) activity in 2012: Toward Higher Quality of Chemistry Teacher In-service Training in Croatia



Participants of the 2CWCE. A snapshot taken between workshoping sessions on Nov. 10<sup>th</sup> 2012.



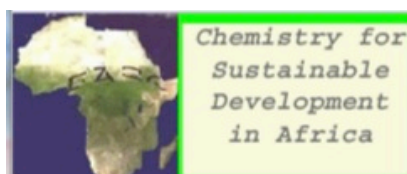


## IUPAC CCE's Flying Chemists Program (FCP)



## E. Partnership with Asia

- The fifth International Conference of Network for Inter-Asian Chemistry Educators (NICE) was held in Taiwan, July 25-27, 2013.
- N=157 from 8 countries/areas



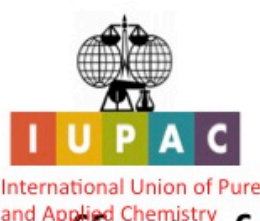
## F. Partnership with Africa

- **YAC in South African, Tanzania, & Ethiopia** (L. Schoen, MH Chiu, E. Steenberg)
- **FCP in 2011** (P. Mahaffy, MH Chiu, L. Schoen, J. Ibañez, H. D. Barke)
- **First African Conference on Research in Chemistry Education (ACRICE-1): Chemical Education for the Human Development in Africa**
  - This conference is going to be held in Addis Ababa ET, December 5-7, 2013.
  - CCE current and past members are invited to deliver talks at the ACRICE-1, such as Prof. Ameen Fahmy (Egypt), Prof. Bob Bucat (Australia), Prof. Jan Apothekar (Netherlands), Prof. John Bradley (South Africa), Prof. Leiv Sydnes (Norway), Prof. Peter Atkins (UK), Prof. Peter Childs (Ireland), Prof. Zafra Lerman (USA), and Dr. Temechegn Engida (Ethiopia).



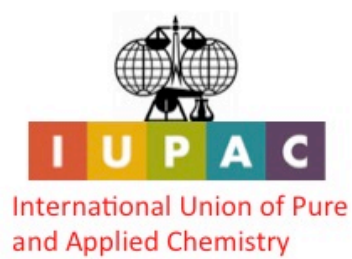
## Interdivisional Projects (Joint Projects with Other Inter-Division /Standing Committees projects or others)

- **Project 1:** A Brief Guide to Polymer Terminology (Joined with Div-IV: Polymer Division)
- **Project 2:** Enhancing Educational Website for Polymer Chemistry (Joined with Div-IV: Polymer Division)
- **Project 3:** Design for International Standards for Chemistry Education (ISCE) (Joined with COCI)
- **Project 4:** Updating, Piloting, and Disseminating Educational Material for Raising Awareness of the Multiple Uses of Chemicals and the Chemical Weapons Convention (Joint with OPCW)
- **Project 5:** A Virtual Colloquium to Sustain and Celebrate IYC 2011 Initiatives in Global Chemical Education (Joint with ACS)
- We appreciate very much for Dr. Fabienne Meyers (Associate Director of IUPAC) and Linda Tapp's excellent documentation in the web site.



Continuous efforts for promoting  
chemistry education across the  
world





Thanks for your attention !

## Attachment 8. International standards



### Development of International Standards for Chemistry Education (ISCE) (IUPAC proposal 2013-022-2)

Task Group Chair : Mei-Hung Chiu (**Taiwan**, Chair and TM of CCE)

Task Group Members :

Jan Apotheker (**The Netherlands**, Secretary and TM of CCE)

Mustafa SÖzbilir (**Turkey**, TM of CCE)

Masahiro Kamata (**Japan**, TM of CCE)

Suzanne Boniface (**New Zealand**, NR of CCE)

Rachel Mamlok-Naaman (**Israel**, NR of CCE)

Hannah Sevan (**USA**)

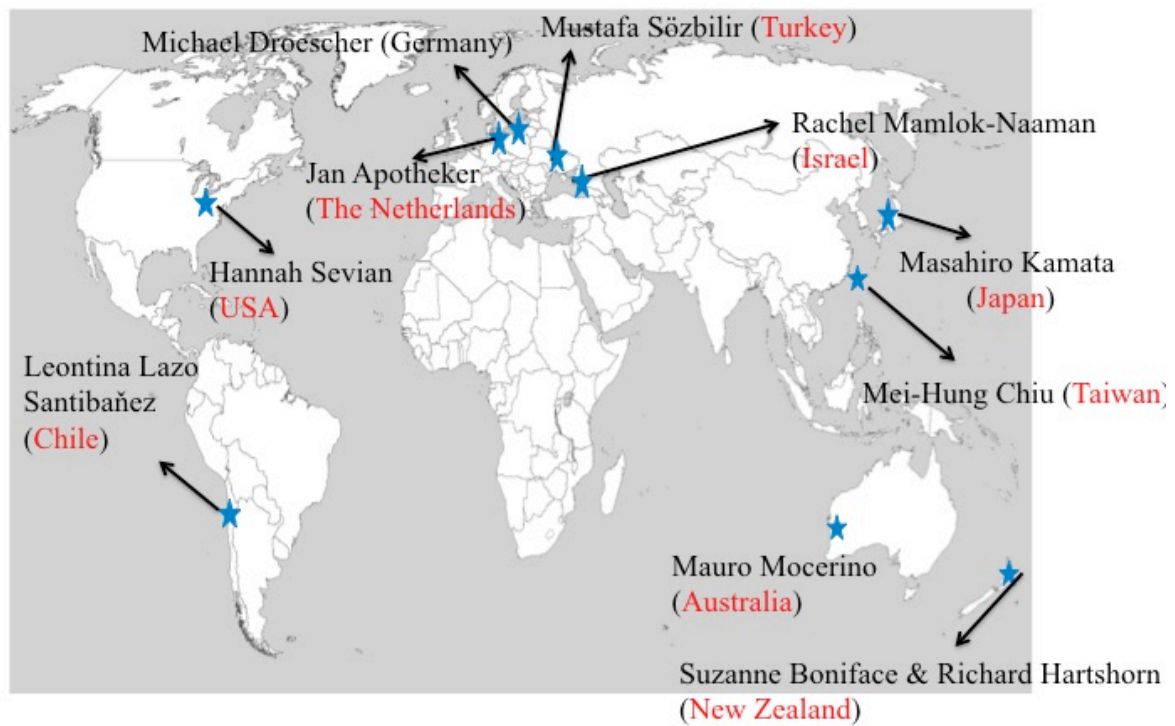
Mauro Mocerino (**Australia**)

Michael Droescher (Germany, Chair of **COCI**)

Richard Hartshorn (NZ, President of Division VIII: Nomenclature)

Leontina Lazo Santibañez (**Chile**)

Progress Reported to IUPAC CCE, August 11, 2013



## Stage 1 of ISCE

### 1. The preparation stage:

ICCE in Rome, July 15 & 17, 2012

Participants: Mei-Hung Chiu (Taiwan)

Rachel (Israel)

Mustafa (Turkey)

Suzanne (NZ)

## Stage 2

### Development of ISCE

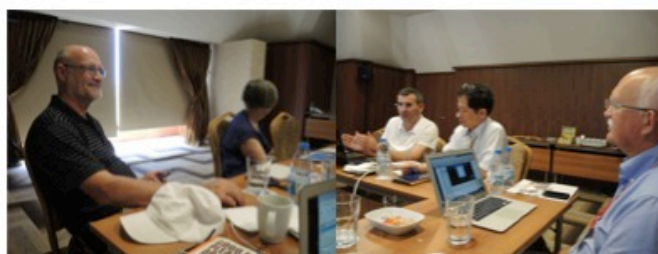
- Date and Time: :  
2:00-5:00, August 10,  
2013

- Participants:

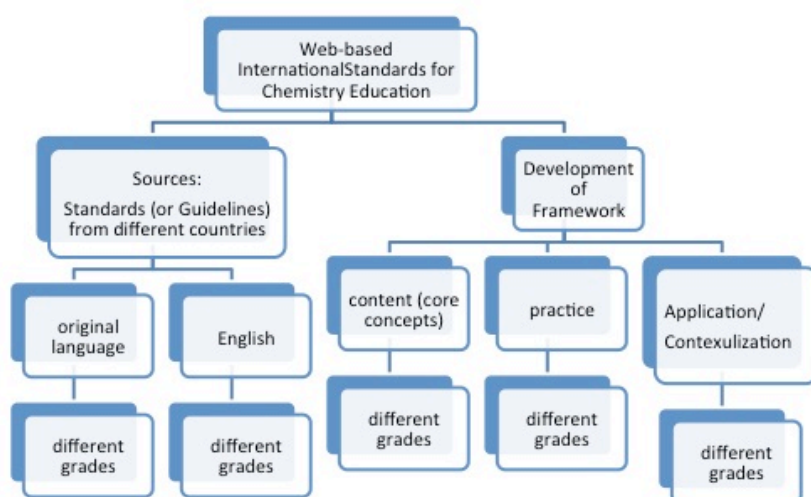
- Mei-Hung, Jan,  
Mustafa
- Masahiro, Suzanne,  
Michael



- Skype: Hannah (from  
USA), Leontina (from  
Chile)



## Web-based ISCE





# What do existing literature tell us ?

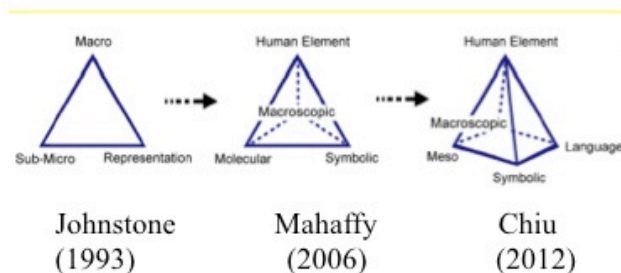


Table 1. The Logical Structure of Chemistry

	Composition & Structure Dimension	Energy Dimension	Time Dimension
Molar Level	1. Relative composition of simple & compound pure substances, solutions & mixtures. Empirical designation of allotropes (size, color, crystal form, $\alpha$ , $\beta$ , etc.).	4. Calorimetric entropies & heats of formation. Free energies & equilibrium constants.	7. Experimental rate laws. Experimental Arrhenius parameters and/or entropies and heats of activation.
Molecular Level	2. Absolute & structural formulas. Rationalization of allotropes as variations in either absolute composition (polymers) or structure (isomers).	5. Molecular interpretation of entropy. Interpretation of heats of formation in terms of heats of atomization, average bond energies, etc. Molecular mechanics.	8. Molecular reaction mechanisms. Molecular view of activation entropies and activated complexes.
Electronic Level	3. Electronic formulas (Lewis str. & electronic config.). Variations in either electronic or nuclear composition (ions & isotopes) or structure (excited states).	6. Calculation of energies based on electronic structure. Interpretation of spectra. Calculation of heats of atomization, spectroscopic entropies, etc.	9. Ionic & photochemical reaction mechanisms. Isotope effects. Calculation of activation energies. Electronic reactivity indices.

Jensen (1998)

Table 1. Core chemistry concepts and ideas included in the NSES organized in different dimensions for each grade band

	K-2	3-5	6-8	9-12
	Macro	Macro	Macro	Macro
States of Matter	Students understand that matter exists in three states: solid, liquid, and gas. They understand that matter can change from one state to another.	Students understand that matter exists in three states: solid, liquid, and gas. They understand that matter can change from one state to another.	Students understand that matter exists in three states: solid, liquid, and gas. They understand that matter can change from one state to another.	Students understand that matter exists in three states: solid, liquid, and gas. They understand that matter can change from one state to another.
Properties of Matter	Students understand that matter has mass and volume. They understand that matter can be measured in terms of mass and volume.	Students understand that matter has mass and volume. They understand that matter can be measured in terms of mass and volume.	Students understand that matter has mass and volume. They understand that matter can be measured in terms of mass and volume.	Students understand that matter has mass and volume. They understand that matter can be measured in terms of mass and volume.
Chemical Reactions	Students understand that chemical reactions involve the transformation of matter. They understand that matter can be conserved in a chemical reaction.	Students understand that chemical reactions involve the transformation of matter. They understand that matter can be conserved in a chemical reaction.	Students understand that chemical reactions involve the transformation of matter. They understand that matter can be conserved in a chemical reaction.	Students understand that chemical reactions involve the transformation of matter. They understand that matter can be conserved in a chemical reaction.
Energy	Students understand that energy is a property of matter. They understand that energy can be transferred from one form to another.	Students understand that energy is a property of matter. They understand that energy can be transferred from one form to another.	Students understand that energy is a property of matter. They understand that energy can be transferred from one form to another.	Students understand that energy is a property of matter. They understand that energy can be transferred from one form to another.

Talanquer, V. & Hannah, S. (submitted to JCE)

## Framework of ISCE (Draft 1)

Framework for ISCE (Version 1)

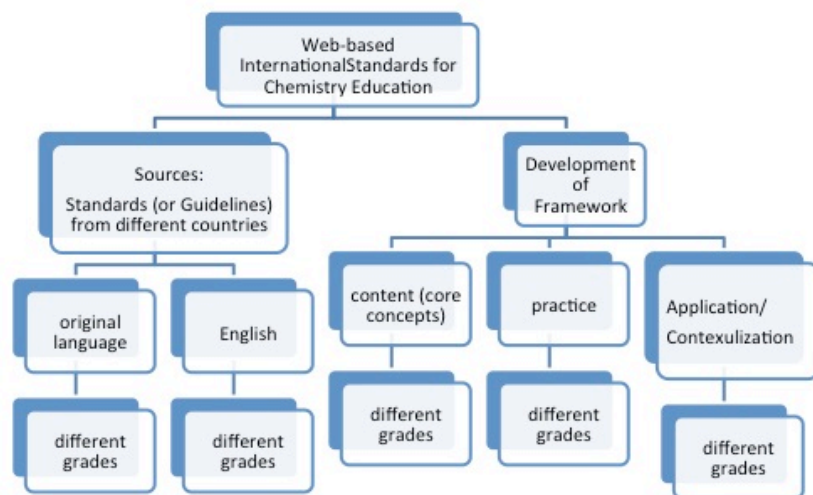
	k-2	3-4	5-6		7-9				10-12			
	Macro	Macro	Macro	Meso	Macro	Meso	Micro	Symbols	Macros	Meso	Micro	Symbols
A. Contents <sup>1</sup>												
B. Practice <sup>2</sup>												
C. Application or contextualization(Chemistry in the world) <sup>3</sup>												

Note 1: List the key topics included in the standards/guidelines from your countries.

Note 2: List domain specific skills (such as synthesis, analysis, and transformation in the area of chemistry)

Note 3: List the possible way to link the content knowledge with daily life experiences or phenomenon

# Web-based ISCE





Thanks for your listening !

Q & A





## **Committee on Chemistry Education (CCE)**

### **Priorities**

- (a) To give priority to initiatives that highlight the relationship between chemistry and sustainable development via working with divisions, also to extend the goals of the IYC the UN Decade for Education for Sustainable Development.
- (b) To maintain a primary focus on working with other partners, across divisions, and stakeholders to maintain momentum of the International Year of Chemistry.
- (c) To emphasize the importance of developing ALL students' inquiry competency and learning outcomes of excellence in chemistry education, both in the developed and developing world.
- (d) To identify new learning and teaching practice in the areas of chemistry education throughout the world.
- (e) To build chemistry education networks among and outside IUPAC, using fully the multicultural capacity within CCE and chemistry to bridge people.
- (f) To continue to support initiatives that raise awareness, social responsibilities, and understanding of ethical issues that are important in chemistry education.

### **Contact information**

Chair (2012-

Prof. Mei-Hung Chiu

Science Education

National Taiwan Normal University

Secretary (2012-

Prof. Jan Apotheker,

University of Groningen,

Netherlands



**Members** (link)

**Activities/Projects** (link)

**Co-operation/Other important links** (link)

**ICCE 2014**

**ECRICE 2014**

### Appendix 3.



## Appendix 4.



# Report on Activities 2011-2012 Sub-Committee on Polymer Education (SPeD)

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## Topics

*continuous*

- Educational Courses, Workshops and Conferences

*Project*

- Division IV - Polymer Education Website
- Reviewing of Polymer Science Textbooks
- Transnational call  
**Showcase Pilot Program for a Research Cooperation between International Funding Organizations and IUPAC as represented by the Polymer Division**

Subcommittee on Polymer Education



## Educational Courses, Workshops, Conferences

---

- 17<sup>th</sup> UNESCO/IUPAC Postgraduate Course in Polymer Science 2012/2013 (Prague)
- POLYCHAR 21 (21st World Forum on Advanced Materials-IUPAC Conference and Short Course on Polymer Characterization March 11-15, 2013, Gwangju, Republic of Korea)
- 12th Annual UNESCO / IUPAC Workshop and Conference 24 – 28 April 2013 Stellenbosch, South Africa
- Polymer Education Symposia in the frame of IUPAC World Polymer Congress Series

Subcommittee on Polymer Education





## 17<sup>th</sup> UNESCO/IUPAC Postgraduate Course in Polymer Science 2012/2013 (Prague)

---

**Objective:** To enable young university graduates and PhDs from countries with limited research facilities to acquire knowledge on recent advances in polymer science and professional skills needed for promotion of polymer science in their home countries. Details at [www.imc.cas.cz/en/umch/kursy\\_unesco\\_iupac.htm](http://www.imc.cas.cz/en/umch/kursy_unesco_iupac.htm)

17<sup>th</sup> UNESCO/IUPAC Course 2012-13 started October 2012 – July 2013

12 students from Bulgaria, Poland, Russia, Ukraine, and Vietnam

18<sup>th</sup> run (October 2013 – July 2014) so far 13 applicants nominated

**Cumulative results of the 17 runs:**

graduates: 138 from 20 countries, publications in international journals: 285,  
communications at international meetings: 329, citations: 4500 (all as of January 2013).

Support through IUPAC Project #2011-052-1-400.

Task leader: **Pavel Kratochvil**

Subcommittee on Polymer Education



## POLYCHAR 21, World Forum on Adv. Materials -IUPAC Conference and Short Course on Polymer Characterization) March 11-15, 2013, Gwangju, Republic of Korea

---

<http://polychar21-korea.org/> Participants: Conference 250, Short Course 83

Sponsored with general IUPAC funds USD 4,000

(Program for Conferences in Scientifically Emerging Regions).

Short Course sponsored by IUPAC Polymer Division with USD 2,000

(support of 14 students/young scientists)

Support of 15 students from under-privileged countries (SE-Asia, Africa, South America)

- Announcement with a bid invitation;
- Selection of applicants on the basis of certain criteria (country, proof of status, letter of recommendation, registration)
- IUPAC secretariat established contact to the candidates and arranged money transfer.

Task leader: **Michael Heß**

Subcommittee on Polymer Education



## 12th Annual UNESCO / IUPAC Workshop and Conference (24 – 28 April 2013) Stellenbosch, South Africa

<http://academic.sun.ac.za/unesco/>

Preference for contributed presentations to young researchers that recently started their academic career and to students and researchers from previously underrepresented universities.

Delegates: 151 from 33 countries; Africa: South Africa, Nigeria.

Students: 53 (12 historically black University students).

A project IUPAC support "13<sup>th</sup> Annual UNESCO/IUPAC Workshop and Conference on Functional Polymeric Materials" has been approved.

Task leaders: **H. Pasch**

Subcommittee on Polymer Education



## Polymer education symposia in the frame of IUPAC World Polymer Congress series

Polymer Education at IUPAC MACRO2014 – Chian Mai, Thailand

**Format**: One day symposium, W. Mormann co-organizer

**Program**: Focus on Polymer Education in South-East Asia

- Situation in different countries (maximum 50 %)
- Lectures on specific topics in Polymer Education  
Names, suggestions appreciated (email to W. Mormann)
- Round Table *Topic? Aim is to involve students also at the table*

Subcommittee on Polymer Education

A project has been approved

## Enhancing Educational Website for Polymer Chemistry

Task group:

C. K. Ober (task group leader)

(W. Mormann)

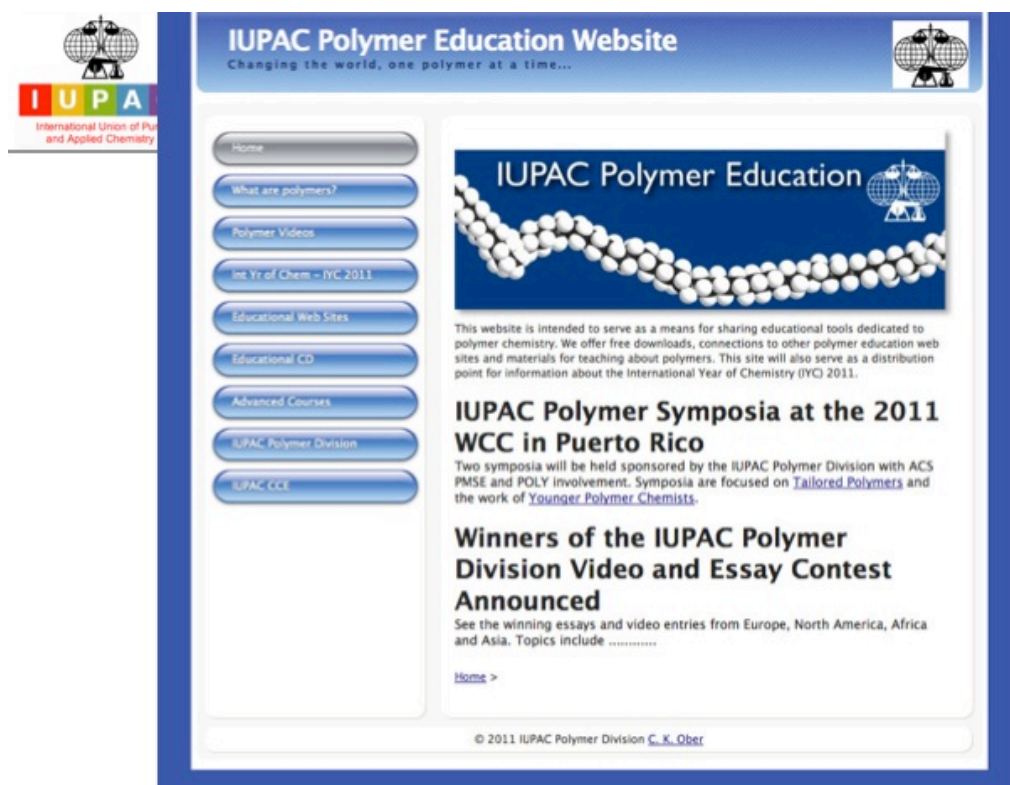
R.G. Jones

C. dos Santos

L. Corley (young observer)

Choon Do

Subcommittee on Polymer Education



Subcommittee on Polymer Education

<http://www.iupac.org/polyedu/index.html>





## IUPAC Terminology in Polymer Science Textbooks

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The intention is the Revision of textbook manuscripts by IUPAC SPT experts to implement IUPAC Terminology and Nomenclature.

Textbooks with this revision should obtain an IUPAC label like:

“Terminology and Nomenclature IUPAC approved” or

“Textbook following IUPAC recommendations for polymer terminology terminology and nomenclature”

### **Benefits for IUPAC (Polymer Division)**

Increased awareness of IUPAC;

Promulgation of polymer terminology and nomenclature

Financial contribution of publisher covering the associated costs should be considered

### **Benefits for Publisher:**

Publishers contacted do not see benefits only legal and copyright problems

Subcommittee on Polymer Education



## IUPAC Terminology in Polymer Science Textbooks

---

### **Outcome of Roanoke meeting discussion:**

Approach an author of a textbook likely to have a new edition and offer the “IUPAC service” on a personal basis with the aim to give the printed version “IUPAC approval”

Dick Jones approached Ian Cowie; his book with Valeria Arrighi as co-author has recently appeared in a new edition.

### **Last remaining option?**

IUPAC Polymer Division should give a price (between 2500 and 5000 USD) to an author, who is willing to implement Nomenclature and Terminology with the help of SPT and SPED members.

It would be great, if that could happen under the flag of SPED.

Perhaps we could launch a project, once an author has been identified.

The price money could come from one of the funds (Samsung?)

Subcommittee on Polymer Education



## IUPAC Transnational/Transcontinental Call for Proposals in Polymer Chemistry

---

7 Proposals were funded with a total of 25 research teams.

<http://www.iupac.org/polyedu/DivIVCall/page6/page7/page7.html>

Mid-term presentations at IUPAC World Polymer Conference Macro 2012, Blacksburg VA. **Tri-National Award Session**

Final reports at a special workshop at IUPAC Macro 2014

Symposium to be organized by the Call Oversight Committee and task group of "Guidelines of multinational Calls-project"

Subcommittee on Polymer Education



## Guidelines of multinational Calls for research cooperation and funding by national funding agencies

---

(Task leader: **W. Mormann**).

Feedback session of primary investigators and task group members during Macro 2012 after mid-term symposium

Project report on the "Experience and Recommendations for Future Calls" together with a collection of relevant documents

[http://www.iupac.org/nc/home/projects/project-db/project-details.html?](http://www.iupac.org/nc/home/projects/project-db/project-details.html?tx_wfqbe_pi1[project_nr]=2010-032-3-400)

[tx\\_wfqbe\\_pi1\[project\\_nr\]=2010-032-3-400.](http://www.iupac.org/nc/home/projects/project-db/project-details.html?tx_wfqbe_pi1[project_nr]=2010-032-3-400)

Documents were used for launching a second call under the guidance of IUPAC:

## International Call for Proposals in Sustainable Chemistry

<http://www.iupac.org/news/news-detail/article/international-call-for-proposal-in-sustainable-chemistry.html>.

Subcommittee on Polymer Education



## appendix 5

## Focus Group Participants

- Nine students participated in the IUPAC Periodic Table of Isotopes Focus Group held on July 23<sup>rd</sup>, 2013.
- One had just completed his freshman year of college.
- Two had just completed their sophomore year of college.
- Two had just completed their junior year of college.
- Four were college graduates. Two of the college graduates will be attending grad school this fall.



## IUPAC Periodic Table of Isotopes Focus Group Overview

IUPAC Project 2007-038-3-200 with Committee on  
Chemistry Education (CCE)

Holden, Norman E., Böhlke, John Karl, Coplen, Tyler B., Mahaffy,  
Peter G., Tarbox, Lauren V., Singleton, Glenda, Walczyk, Thomas  
R., Wieser, Michael, Yoneda, Shigekazu, and de Laeter, John R.

# Information on the back of the IPTI

## Students Comments:

- Loved layout.
- Easy to understand and follow.
- Isotopic Abundance is clearly explained.
- $C^{12}$ - $C^{13}$  information is easy to understand.
- Needs an example of an unstable red isotope cell with the color cell examples.
- The size of the Table is big enough for them to read.
- They all could see themselves using this as a Quick reference for the Student Guide.



## Student Guide

- Make students guide visually appealing like the Supplement document.
- 4 page document is a great straight A to B document that could be used as a student guide with a few updates.
- Needs visual aids. Graphs or pictures to help explain
  - Students want to see an example of each element cell when the background color and radioactive red numbers are being discussed.
- Add last 2 paragraphs from "Terminology Related to Isotopes" section in 23 page document to this document (use this information to replace what is currently in the document).
- Add "For More Information" link section from 23 page document to student guide as well.
- Isotopic abundance section from Supplement could be used in this document.
- $C^{12}$ - $C^{13}$  information is easier to understand from Supplement, could be used here as well.
- Unclear what uncertainty is in "Explanation of the IUPAC Periodic Table of the Isotopes" section of the 4 page document.
- Needs example of variations of isotopes.
- Atomic weights and uncertainty information is more clearly explained in the 23 page document-standard atomic weight associated with "uncertainty" easier to follow.
- Isotopic fractionation needs an example.
- Students like the mole definition from the 23 page document and want it used in the student guide.



## Student Guide continued

- Information about the denominator ( $(1/2) \cdot 12u$ ) in “Isotopic Abundances and Atomic Weights” section needs to be explained/expanded on. Students could not follow current explanation in the 4 page document.
- 4 page document: The 1<sup>st</sup> paragraph in the “Explanation of the IUPAC Periodic Table of the Isotopes” section seems repetitive to the students and can be shortened.
- From the 4 page document students could not explain or give examples about what causes isotopic abundance.
- 11 page document section on “Isotopic abundance and isotopic variation” was better than in the 4 page doc, would like to see this moved to 4 page doc
- Students would like a Terminology section like in the 23 page document and a glossary.
- 11 page document- “Introduction to Isotopes” section-3<sup>rd</sup> page first full paragraph, starts with “For elements with two or more stable isotopes, the atomic weight....”, could use this information in the student guide- students liked this better.
- 11 page document- “Variations in Isotopic Composition of the Elements” section, page 4 of doc, 2nd full paragraph- students liked this explanation of calculating the atomic weight of an element better and want it to go in student guide. Paragraph starts with “The atomic weight of an element can be determined from the sum of the products of the isotopic abundance value....”
- Students like the IUPAC periodic table explanation better in the 11 page document and would like to see it in the student guide.



## Teachers Guide

- 23 page document has a lot of information and is a good document for the right audience. Students felt this would make a good teachers guide.
- Organize pertinent information to the front and extra information as a supplement toward the back of the guide, specifically Nucleosynthesis and Radioactivity.
- Students felt it was important to give the teachers more information than the students.
- Use the color cell images when describing them in the guide.
- Use an example of an unstable red isotope cell with the color cell examples.
- Practical Uses of Isotopes section- Radioactivity and geochronology section- a great example for the students of human interference to create varying natural abundance was the bomb peak information and they feel it needs to be included in the other guides.
- Isotopic Fractionation section needs work. Student comments about Isotopic Fractionation section:
  - needs to be broken up and clarified
  - equilibrium section gets muddled
  - add images/graphs to make it more approachable
  - thermodynamics part is difficult to follow



## Other Comments

- Terms in the glossary should be in **bold** font throughout both guides.
- The 11 page guide was no good and should be removed. Students found it too hard to follow and understand.
- Readily acceptable information is easier to use. Fractionation and Nucleosynthesis is hard for students to grasp.
- Images and diagrams are needed to make the material appear less intimidating and more student friendly.
- References on Application pages should be a smaller font- maybe 6pt font- they take up too much room on the paper.
- For Application pages there is no need to match reference # with each application write up.



## Guide Glossary Terms

- Students like the current list of terms that were bolded in all three guides and the glossary at the end of the 11 page guide. Here is a list of terms they would like added to the glossary for the guides.
- absolute dating
- alpha particles
- atoms
- beta particles
- electrons
- gamma rays
- isotope
- isotopic fractionation
- isotopic mass
- mass number
- neutrons
- nuclear fission
- protons
- radiogenic isotope
- rp process
- r-process
- s-process
- uncertainty





## Application document Glossary Terms

Students reviewed the Application document and created a list of terms they would like to see in a Glossary at the end of the document.

- accelerator mass spectrometry
- accumulation
- alpha decay
- alpha emitter
- angiography
- anthropogenic
- assimilation
- Auger electrons
- beta-emission
- beta-minus decay
- bioavailability
- bioconjugates
- biogenic silica
- biogeochemical
- Bio-silicone
- biota
- biotransformation
- blood pool imaging
- boron neutron capture therapy (BNCT)
- brachytherapy
- CANDU nuclear reactors
- cationic perfusion
- Cerenkov counting
- chemical shim
- chondrites
- chronometer
- cladding
- clandestine
- colloidal
- computed tomography (CT)
- continuous flow isotope ratio mass spectrometry (CF-IRMS)
- cosmic ray
- cosmogenic
- crustal nucleogenic
- cyclotron
- cytotoxic
- densitometric measurements
- deposition
- double beta decay
- elution
- eutrophied
- fissionable
- fission reactor
- fractionation
- gamma radiograph
- gamma radiography



## Application document Glossary Terms continued

- gamma ray spectroscopy
- gas chromatography-combustion-isotope ratio mass spectrometry (GC-C-IRMS)
- Geiger counter
- geochronology
- half-life
- heavy ion linear accelerator (HILAC)
- High Flux isotope Reactor (HFIR)
- homeostasis
- humates
- hydrothermal
- in situ
- in vivo
- inductively coupled plasma mass spectrometry (ICP-MS)
- isomeric transition
- isotopic abundances
- isotope ratio mass spectrometry (IRMS)
- isotope fractionation
- irradiation
- liquid scintillation analyzer
- magnetic resonance imaging (MRI)
- magnetic resonance microscopy (MRM)
- Maser
- metalloradiopharmaceuticals
- metallurgical processes
- microspheres
- monoclonal antibodies (mab)
- monoenergetic conversion electrons
- murine ventricular functions
- myocardium
- natural terrestrial material
- neutrino
- neutron absorption
- neutron activation analysis (NAA)
- Neutron Capture Therapy (NCT)
- neutron flux
- Nuclear Magnetic Resonance spectroscopy (NMR)
- nucleogenic
- nucleosynthesis
- nuclide
- oncologic
- Packard Tri-Card 1500 liquid scintillation analyzer
- paleoclimate



## Application document Glossary Terms continued

- paleohydraulic gradient
- Pharmacokinetic
- physicochemical
- porphyrins
- positron emitting radionuclides
- positron emission tomography (PET)
- Prompt Gamma Neutron Activation Analysis (PGNAA)
- Radiochemical
- radioembolization
- radiogenic
- radiography
- radioimmunoconjugates
- radioimmunotherapy
- radioisotope
- Radiomicrosphere
- radionuclide
- radiopharmaceuticals
- radiosynovectomy
- radiotherapy
- rapid neutron capture process (r-process)
- residence time
- scintigraphy
- scintillation camera
- single photon emission computed tomography (SPECT)
- sorption
- spallation (cosmic-ray)
- spinel layer
- stable isotope fractionation
- supergene
- supernova (supernovae)
- suspended particulate matter (SPM)
- terrestrial isotopic composition
- thermal speed
- thermoelectric generators
- trophic
- vertical accretion



appendix 6.



2014

# international year of crystallography



Ilia Guzei

University of Wisconsin-Madison  
Madison, WI USA

Co-editor of Acta Crystallographica  
American Crystallographic Association  
International Union of Crystallography

2014

# international year of crystallography



- to increase public awareness of the science of crystallography and how it underpins most technological developments in our modern society
- to inspire young people through public exhibitions, conferences and hands-on demonstrations in schools
- to illustrate the universality of science
- to intensify the programme Crystallography in Africa and create similar programmes in Asia and Latin America
- to foster international collaboration between scientists worldwide, especially North–South contributions
- to promote education and research in crystallography and its links to other sciences
- to involve the large synchrotron and neutron radiation facilities worldwide in the celebrations of IYCr2014, including the SESAME project set up under UNESCO auspices

2014

# international year of crystallography



- Organizing travelling hands-on exhibitions
- Launching an open-access crystallography journal
- Providing all levels of students, from pre-school to university, with crystallography demonstrations at appropriate levels
- Publicizing the contributions that crystallographers make to the global economy by submitting articles to the press and to magazines or developing television and radio programmes
- Sponsoring poster exhibitions highlighting the usefulness and wonders of crystallography
- Organizing problem-solving projects through which students can use their knowledge of crystallography, physics and chemistry
- Publicizing the contributions that crystallography has made to improve lives, particularly recent developments in drug design and material science
- Organizing crystal-growing competitions
- Interacting with governments to underscore the importance of a strong crystallographic education
- Organizing consultations concerning the best ways to save all diffraction data collected in large-scale facilities and crystallography laboratories

2014

# international year of crystallography




- International Union of Crystallography
- American Crystallographic Association
- Crystal growing competitions (local and international)
- Conference presentation on IUPAC projects?
- Poster prize sponsorship?
- Launch of a new crystallography journals by the International Union of Crystallography and by the American Crystallographic Association
- International Union of Crystallography Congress in Montreal



2014

international year of  
crystallography



Partners for the International Year of Crystallography 2014

Ô IYCr2014  
Celebrate  
Disseminate  
Innovate

Ô Activities  
Past events  
Ceremonies  
Events  
Promotion

Ô Participate


crystallography

Michele Zema  
Crystallography and  
Society  
Santander, 8 July 2013

---

2014

international year of  
crystallography



Partners for the International Year of Crystallography 2014

Ô IYCr2014  
Celebrate  
Disseminate  
Innovate

Ô Activities  
Past events  
Ceremonies  
Events  
Promotion

Ô Participate

crystallography

Michele Zema  
Crystallography and  
Society  
Santander, 8 July 2013

# IUCr-UNESCO

- Ω in Africa, Asia and Latin America in collaboration with diffractometer manufacturers
- Ω two types of OpenLabs (I and II)
- Ω students from nearby countries will travel to the OpenLab
- Ω hubs will host posters and lectures or workshops, along with hands-on experiments on the use of diffractometers
- Ω follow-up

In collaboration with



PANalytical



Agilent Technologies

## summit meetings

intra-region cooperation

- 
- Ω Latin America (Campinas, Brazil) Medicine and bio-crystallography
  - Ω Africa (Bloemfontein, South Africa) Material science and XRPD
  - Ω Asia (Karachi or Hyderabad, Pakistan) Crystallography and Chemistry

The Summit Meetings will stress high-level science and also highlight the problems and difficulties in conducting competitive scientific research in several parts of the world.

They are also aimed at discussing the actual possibilities for developing crystallographic research and technology in those regions.

2014

# international year of crystallography



- 1895 – Discovery of X-rays
- 1914 – Max von Laue (Nobel Prize Nobel Prize for Physics in 1914 for his discovery of the diffraction of X rays in crystals) diffraction experiment
- Computerized tomography
- Nuclear magnetic imaging
- Positron emission tomography
- Ultrasound

Attachment 7 ppt of Maja Elmgren



# UPPSALA UNIVERSITET



## CCE-IUPAC project

BEST PRACTICE IN THE USE OF  
LEARNING OUTCOMES IN  
CHEMISTRY EDUCATION



## Project objectives

Learning outcome driven chemistry education is increasingly practiced, providing new opportunities for international comparisons.

We will develop a method for benchmarking (i.e. learning by sharing and comparing best practice) these outcomes, to enhance learner-centered chemistry education both in the developed and developing world.

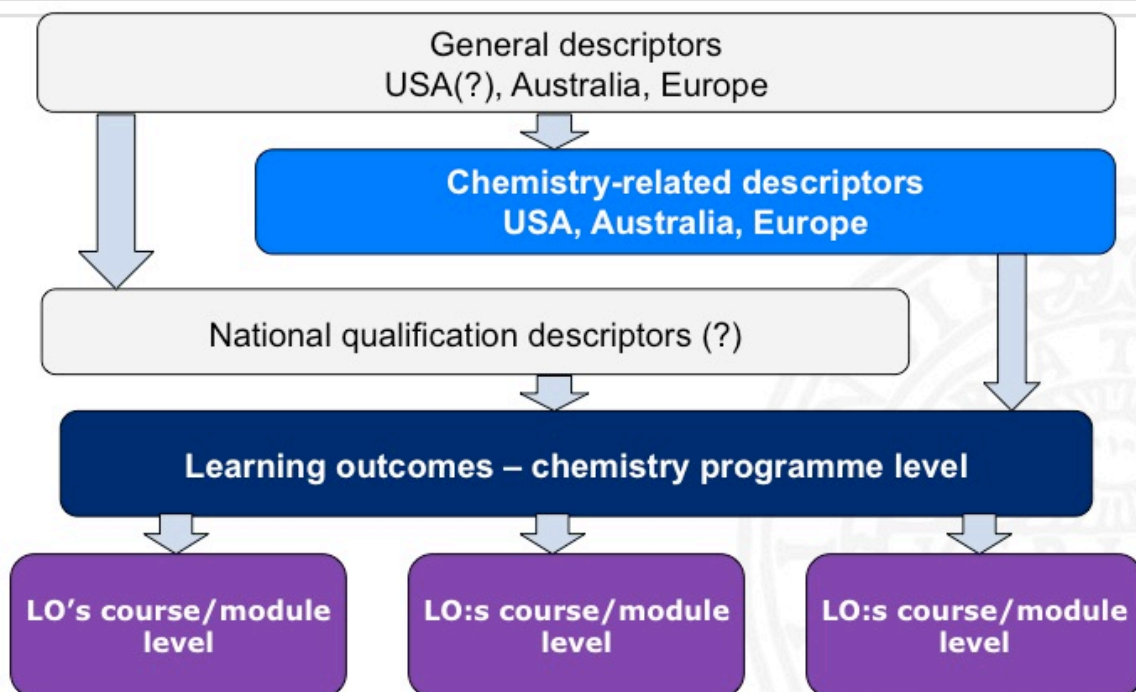
The project builds on and extends the task group experiences from nationals and international projects.

## Over arching QF with Learning outcomes

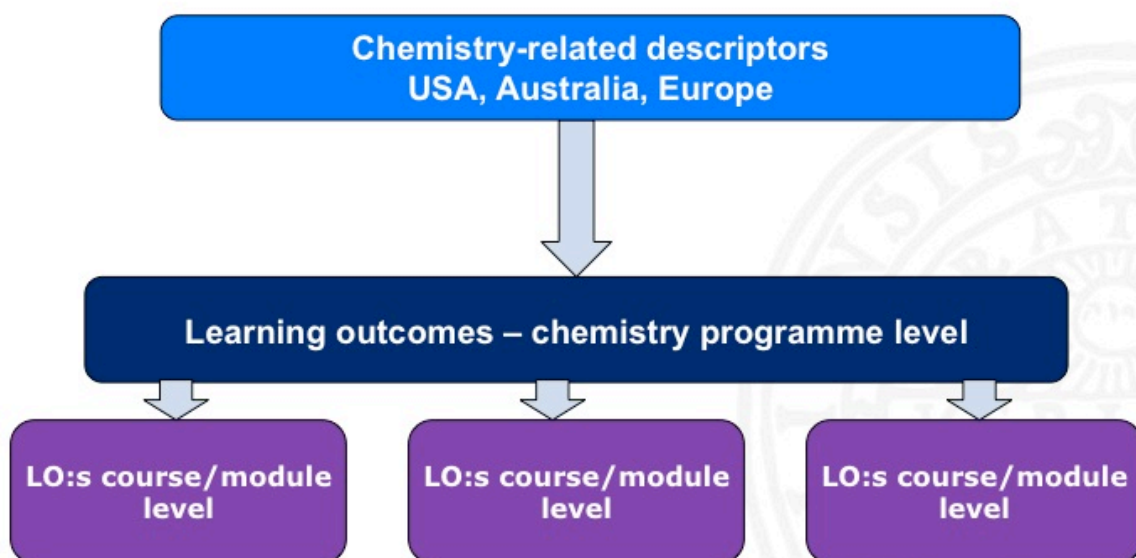
- Eurobachelor - Europe
- ACS guidelines - USA
- Learning and teaching Academic Standards – Australien
- Both similar and different?
- Applicable? Useful? Yes!



## Learning outcomes at different levels



## In focus during the workshop





## Constructive Alignment



## Preparation

Rome workshop laid the foundation

- Shared vision
- Discussion about definitions
- Agreement on process
- Comparison of framework

Tool for self-analysis developed

Self-analysis completed prior to workshop

### Presentations

#### Evaluation of overarching descriptors

- Comparison and critical investigation
- Looking ahead and looking out

#### Self-analysis with feedback

- Comments and feedback regarding completed work
- Analysis of learning outcomes for chemistry programs
- Analysis of learning outcomes for courses/modules

### Conclusions

#### Dissemination of results

## Lessons learnt

The workshop as a whole was productive

### Frameworks

- Similar in content – different in style
- Threshold or aspiration
- Themes/headings, formulations and emphasis
- Useful for inspiring and initiating discussion

### Self-analysis

- No-one has a perfect solution (blind spots, lack of progression, no assessment, implicit LO:s...

The process was most important

## How to proceed

Refine the tool for self-analysis

Write a report

Article for CI

Workshop in Toronto?

Flying Chemists Program?

Guide?

### Workshop participants

Maja Elmgren (SWE)  
Eva Åkesson (SWE)  
Felix Ho (SWE)  
Madeleine Schultz (AUS)  
Siggy Schmid (AUS)



Nina Aremo (FIN)  
Pascal Mimero (FRA)  
Christiane Reiners (GER)  
Ilka Parchmann (GER)  
Andrea Schumacher (GER)  
Jan Apotheker (NED)  
Ria Dolfing (NED)  
Marcy Town (USA)

## Attachment 8. International standards



### Development of International Standards for Chemistry Education (ISCE) (IUPAC proposal 2013-022-2)

Task Group Chair : Mei-Hung Chiu (**Taiwan**, Chair and TM of CCE)

Task Group Members :

Jan Apotheker (**The Netherlands**, Secretary and TM of CCE)

Mustafa SÖzbilir (**Turkey**, TM of CCE)

Masahiro Kamata (**Japan**, TM of CCE)

Suzanne Boniface (**New Zealand**, NR of CCE)

Rachel Mamlok-Naaman (**Israel**, NR of CCE)

Hannah Sevan (**USA**)

Mauro Mocerino (**Australia**)

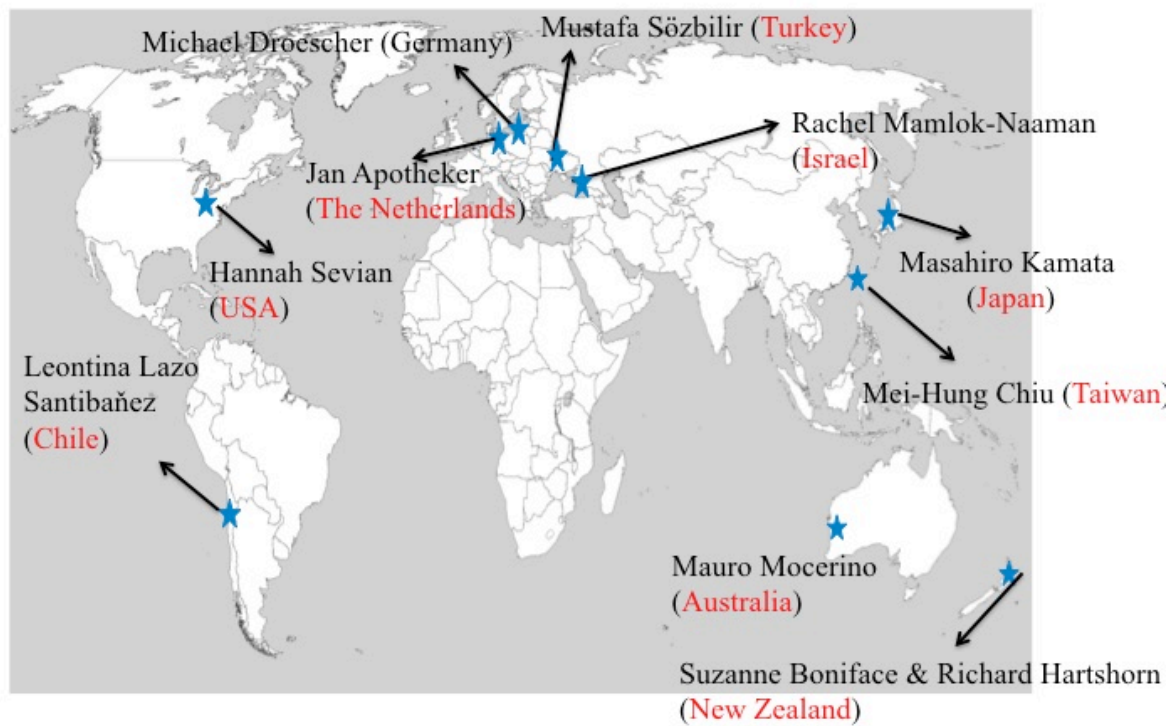
Michael Droescher (Germany, Chair of **COCI**)

Richard Hartshorn (NZ, President of Division VIII: Nomenclature)

Leontina Lazo Santibañez (**Chile**)

Progress Reported to IUPAC CCE, August 11, 2013





## Stage 1 of ISCE

### 1. The preparation stage:

ICCE in Rome, July 15 & 17, 2012

Participants: Mei-Hung Chiu (Taiwan)

Rachel (Israel)

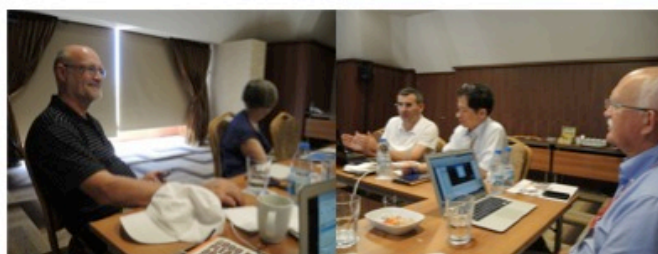
Mustafa (Turkey)

Suzanne (NZ)

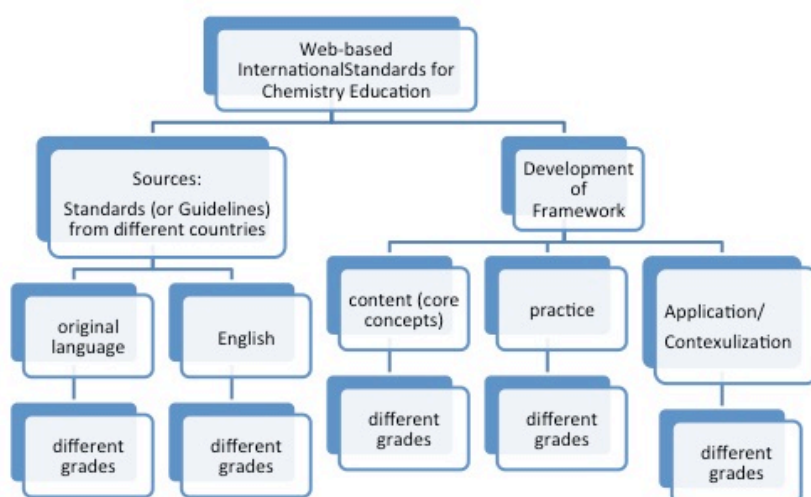
## Stage 2

### Development of ISCE

- Date and Time: :  
2:00-5:00, August 10,  
2013
- Participants:
  - Mei-Hung, Jan,
  - Mustafa
  - Masahiro, Suzanne,
  - Michael
- Skype: Hannah (from  
USA), Leontina (from  
Chile)



## Web-based ISCE

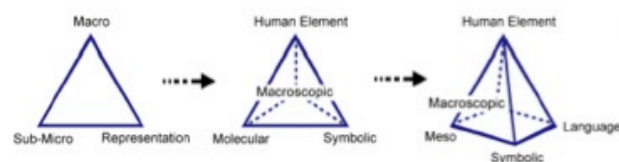


## What do existing literature tell us ?

Table 1. The Logical Structure of Chemistry

	Composition & Structure Dimension	Energy Dimension	Time Dimension
Molar Level	1. Relative composition of simple & compound pure substances, solutions & mixtures. Empirical designation of allotropes (state, color, crystal form, $\alpha$ , $\beta$ , etc.).	4. Colorimetric entropies & heats of formation. Free energies & equilibrium constants.	7. Experimental rate laws. Experimental Arrhenius parameters and/or entropies and heats of activation.
Molecular Level	2. Absolute & structural formulas. Rationalization of allotropes as variations in either absolute composition (polymers) or structure (isomers).	5. Molecular interpretation of entropy. Interpretation of heats of formation in terms of heats of atomization, average bond energies, etc. Molecular mechanics.	8. Molecular reaction mechanisms. Molecular view of activation entropies and activated complexes.
Electrical Level	3. Electronic formulas (Lewis str. & electronic config.). Variations in either electronic or nuclear composition (ions & isotopes) or structure (excited states).	6. Calculation of energies based on electronic structure. Interpretation of spectra. Calculation of heats of atomization, spectroscopic entropies, etc.	9. Ionic & photochemical reaction mechanisms. Isotope effects. Calculation of activation energies. Electronic reactivity indices.

Jensen (1998)

Johnstone  
(1993)

Mahaffy  
(2006)

Chiu  
(2012)

Table 1. Core chemistry concepts and ideas included in the NSES organized in different dimensions for each grade band.

[illegible]

Talanquer, V. & Hannah, S. (submitted to JCE)

# Framework of ISCE (Draft 1)

### Framework for ISCE (Version 1)

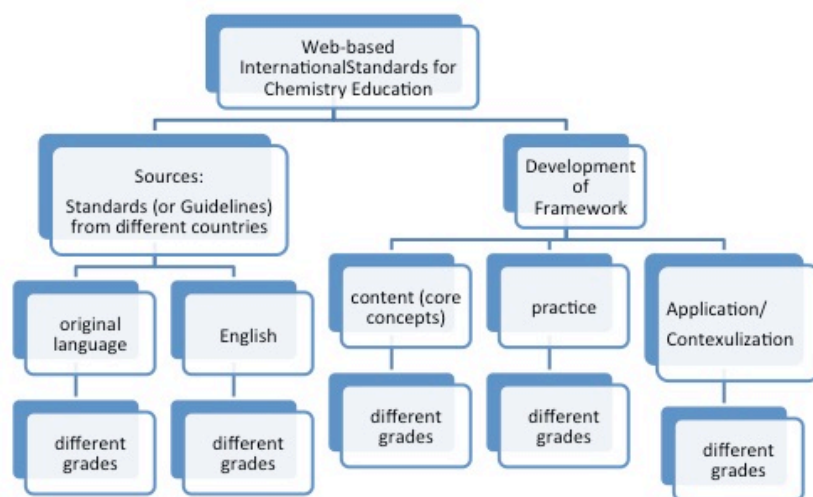
[illegible]

Note 1: List the key topics included in the standards/guidelines from your countries.

Note 2: List domain specific skills (such as synthesis, analysis, and transformation in the area of chemistry)

Note 3: List the possible way to link the content knowledge with daily life experiences or phenomenon

# Web-based ISCE







Thanks for your listening !

Q & A



## Appendix 9. Overview ICCE 2014



International  
Conference on  
Chemistry  
Education 2014  
TORONTO, CANADA

## Progress Report

- Booked venue
  - Opening ceremony, plenary lecture and reception and workshops : University
  - Concurrent sessions: Metro Toronto Convention Centre
- Established web site
  - [www.icce2014.org](http://www.icce2014.org)
- Contracted for abstract and registration software
- Invited plenary lecturers
- Solicited symposia and workshop topics and chairs
- Booked dinner cruise for Wednesday evening
- Solicited exhibitors
- Initiated fundraising

## Plenary Lecturers

- Jorge Ibanez - Universidad Iberoamericana-Mexico City
- Martyn Poliakoff - University of Nottingham
- John Polanyi - University of Toronto
- Bassam Shakhashiri - University of Wisconsin
- Joe Schwartz - McGill University
- Hsin-Kai Wu - National Taiwan Normal University

## Communicating across the Educational Levels

- Research on Teaching and Learning in the Chemical Sciences
- Theoretical Frameworks Used in International Chemical Education Research
- The Role of Education in Responsible Research and Innovation
- Research on Learning in the Laboratory
- Bridging the Gap between Chemistry Education Research and Practice
- The Industry-University Interface
- Preparing Chemistry Students for Communicating in Academia and Beyond
- 21<sup>st</sup> Century Chemistry Literacy: Means for Fostering Student Engagement among All High School Learners



## Outreach to the Lay Community

- Chemistry for All Citizens of Planet Earth: Creative Ways of Communicating Chemistry
- An Insider Look at Regulations and Science in Industry - Public Perception vs. Industry Reality
- Service Learning in the Chemical Sciences



## International Student Learning Communities

- Chemistry Education: International and Multicultural Perspectives
- Chemistry Education in Small or Remote Communities and in Developing Countries



## Technological Support of Chemistry Learning

- Mobile Devices in Chemical Education
- Electronic Resources to Support Learning in Organic Chemistry
- Opening Up Chemistry Education
- On-line Resources for Chemical Education

## Interdisciplinary Collaborations


- Chemistry Collaborations beyond the Faculty of Science
- Interdisciplinary First-Year Science Programs
- Teaching and Learning Chemistry through Rich Contexts
- Molecular Gastronomy: A New Emerging Scientific Discipline

## Greening Attitudes in Chemistry Education

- Practical Green Chemistry in the Laboratory
- Promoting Green Chemistry outside of the Classroom and Laboratory: U of T Green Chemistry Initiative

## Workshop Proposals

- Storytelling, Branding and Persuasion Workshops - Tools for Effective Engagement of Lay Audiences by Chemists
- Computational Chemistry in Chemical Education
- Using Facebook as an Educational Tool for Chemistry at All Levels of Education
- Navigating an Internet of Chemistry via ChemSpider and other Cheminformatics Services for Educators
- ChemCollective Virtual Laboratory

- 
- Practical Green Chemistry in the Laboratory
  - Microwave-Assisted Chemistry in the Classroom: Teaching Green Chemistry at the Speed of Light
  - Visualization Strategies to Promote Student Learning
  - Flipped Learning Methodologies
  - Introduction to POGIL (Process Oriented Guided Inquiry Learning)



## Timelines Going Forward

- |                |  |
|----------------|--|
| • July 2013    | deadline for symposia and workshop submissions                 |
| • October 2013 | abstract submissions open                                      |
| • January 2014 | abstract submission deadline                                   |
| • March 2014   | notification of abstract acceptance, registration opens        |
| • May 2014     | preliminary program available, early registration fee deadline |
| • July 2014    | ICCE2014, July 13-18   |