

IUPAC Committee on Chemistry Education Report on Activities 2006

Peter Mahaffy, Chair

1. CCE Structure, Membership and Transition

CCE is working through its first substantial leadership transition in 2006. Our founding chair, Peter Atkins and long-standing secretary Elisa Pestana have completed their service as officers and titular members. Much of the work of the committee has been directed through two subcommittees, and the chairs of both our Chemistry Education for Development (CED) and Public Understanding of Chemistry (PUC) sub-committees have changed this year – Ram Lamba has stepped down as chair after being appointed as chancellor of the University of Puerto Rico in Cayey, and I have stepped down as PUC chair to assume the role of CCE chair.

We owe an enormous debt of gratitude to our retiring titular members, associate members, and national representatives for their service to CCE and IUPAC. In particular, we are grateful for the tireless efforts of Peter Atkins to envision, define, and clarify IUPAC's educational role; set directions for CCE; and build bridges between CCE and divisions and standing committees.

Transition also provides new opportunities to own priorities, and initiate new activities and approaches. I am pleased that CCE members have so willingly stepped into new leadership roles. For 2006, Eva Åkesson (Sweden) has added the role of CCE secretary to her division liaison role; Tony Ashmore (UK) has been appointed as the new Public Understanding of Chemistry Sub-committee chair and Mei-Hung Chiu (Taiwan) the new Chemistry Education for Development Sub-committee chair. Conference coordinator Warren Beasley (Australia) and CCE Project Group coordinator Choon Do (Korea) provide continuity and round out the CCE leadership team.

In our leadership strategy meeting in February 2006 hosted by Ram Lamba, we focused on transition and proposing new directions for the biennium. The full CCE membership engaged these ideas and brought many new ones to our August CCE meeting held in conjunction with the 19th International Conference on Chemistry Education in Seoul.

We have communicated with CCE associate members our desire to continue to build strong relationships with divisions and the other IUPAC standing committees, and have suggested as roles for associate members the following:

- Represent to CCE the educational dimension of divisional and standing committee activities.
- Identify activities within divisions and standing committee that have educational and/or public understanding spin-off.
- Be aware of CCE's strategies and resources and communicate these to divisions and standing committees
- Identify and promote interdivisional and standing committee educational projects.

We have also had good discussions with national representatives at our CCE meeting in Seoul about the crucial role they play within CCE and IUPAC, and are working on ways to involve every national adhering organization in the educational work of IUPAC and create larger opportunities for NR involvement in committees and projects. We note that the two new CCE sub-committee chairs are national representatives from Taiwan and the United Kingdom, respectively.

A complete list of CCE members is found in Appendix I.

2. CCE Directions for 2006-07

We have identified the following priority areas for the 2006-07 biennium.

- To foreground the importance of learner-centred chemistry curriculum, both in the developed and developing world. The extent to which this is done should be one criterion used to assess educational projects.
- To give priority to initiatives that highlight the relationship between chemistry and sustainable development, consistent with the goals of the UN Decade for Sustainable Development.
- To continue to support initiatives that highlight ethical concerns in chemistry, including the collaboration that has developed between IUPAC and OPCW.
- Increasing the public understanding of chemistry is of central importance to CCE. In this biennium we plan to work closely with COCI and divisions to obtain broad IUPAC approval for and implementation of our report proposing a niche for IUPAC in public understanding of chemistry. One measure of success will be for Public Understanding of Chemistry to be seen as everyone's responsibility, tied into all IUPAC projects and activities in appropriate ways.
- The biennial International Conferences on Chemistry Education are flagship activities for CCE. We seek to more fully integrate ICCE activities into the work of CCE and use ICCE conferences to report the outcomes of CCE projects and bring participants together to implement CCE strategies.
- To build chemistry education networks, using fully the multicultural competence within CCE.
- To articulate clear directions for the Chemistry Education for Development subcommittee, and include the Flying Chemist Program as an integral part of the work of that subcommittee.

Subcommittees

3.1 Report of The Public Understanding of Chemistry Subcommittee, following the CCE and Subcommittee Meetings in Seoul

Chair, Tony Ashmore

3.1.1. Membership

Tony Ashmore, UK, Chair
Liberato Cardellini, Italy
Shu-Nu Chang, Taiwan
Peter Childs, Ireland
Choon Do, Korea
Masato Ito, Japan
Lida Schoen, Netherlands

3.1.2. IUPAC's Role in PUC

The draft report from IUPAC project 2004-047-1-050, "*Public Understanding of Science: Identifying IUPAC's Niche*," was the subject of a workshop at the IUPAC General Assembly in Beijing, sessions within the 19th ICCE in Seoul, and articles in "Chemistry International". It has been posted on IUPAC's web page for public comment, and has been very well received. Following final editing, it will be formally submitted to the Bureau for adoption in October 2006 as a technical report and publication in "Pure and Applied Chemistry". Other publication and dissemination opportunities will be sought by Peter Mahaffy and Tony Ashmore.

3.1.3. Torino General Assembly, 2007

There are plans for a public reading/performance of Roald Hoffman's new play, "Should've," which addresses ethical issues common to the arts and science. This should be linked to:

- A plenary lecture by Roald Hoffmann
- A workshop on multiple uses of chemicals by Peter Mahaffy, Alastair Hay, Natalia Tarasova and others
- A symposium on ethical issues facing chemists, and by extension, IUPAC; leading to a round table discussion to draft guidance on ethics for IUPAC.

Project funding will be required. Tony Ashmore and Peter Mahaffy to draft. Liberato Cardellini will liaise with the local organisers on the above.

3.1.4. Nanotechnology

Alex Pokrovsky, representing COCI at the CCE meeting, circulated a PowerPoint presentation prepared by Alan Smith. It is a large collection of useful images of

applications of nanotechnology for use in a presentation by an expert, which will require additional material if it is to be used as an educational resource. Tony Ashmore will contact Alan Smith. This may be the subject of a project.

IUPAC is recommended to commission a technical report on nanotechnology - benefits and concerns - as a contribution to its public understanding of chemistry remit within the context of the report in 3.1.1 above.

3.1.5 Supporting National Chemical Societies

The ICCE conferences and General Assemblies provide an opportunity for chemists involved in the education work of national chemical societies to meet and share good practice. IUPAC can help societies through dissemination of the public understanding of chemistry report, thus assisting societies to evaluate and thereby enhance their PUC strategies and activities, and through the "Flying Chemists Program."

3.2 Report of The Chemistry Education for Development Subcommittee, following the CCE and Subcommittee Meetings in Seoul

Chair, Mei-Hung Chiu

3.1.1. Membership

Mei-Hung Chiu, Taiwan, Chair
John Bradley, South Africa
Bob Bucat, Australia
Masahiro Kamata, Japan
Ram Lamba, Puerto Rico
Lida Schoen, Netherlands
Natalia Tarasova, Russia

3.1.2 Flying Chemists Program (FCP) --- an existing plan

The Flying Chemists Program was initiated in 2005, with the aim of providing emerging countries means to improve the teaching and learning of chemistry at primary, secondary, and tertiary levels. A FCP visit must be initiated by a National Society, Ministry of Education or Technology, or another comparable substantial organization. Two visits have been carried out under this program in the past two years, providing resources to strengthen chemistry education and to assist a country in its development.

In 2006 a FCP visit was made to Sri Lanka by two CCE members and two external consultants, addressing general issues of tertiary science education, as well as specific topics in physical, inorganic, organic and environmental chemistry. This program is worthwhile continuing in the future, and we are

working at integrating it more fully into the work of the Chemistry Education for Development Sub-Committee. Several queries have been made from other countries about criteria for hosting a visit.

Preliminary discussion of two new areas for activities was initiated in Seoul, as outlined below. These will be developed further and brought forward at a later date.

3.1.3 Developing Scientific Chemical Senses (DSCS) --- A Preliminary Idea

Goals:

- To establish mutual understanding between chemical industry and individuals
- To facilitate cooperation between international chemical companies and local residential communities
- To promote the real understanding of chemical processes in daily life
- To create learning opportunity for young students in developing countries

3.1.4 Translating Chemistry Terminologies to Teacher-Friendly Language -- A Preliminary Idea

Goals:

- To develop a pedagogical handbook for chemistry teachers
- To provide chemistry terminologies, misconceptions, teaching strategies, instructional resources (including e-learning) to chemistry teachers as well as students
- To link research theory with empirical teaching

3. International Conferences on Chemistry Education

One of CCE's highest profile activities is oversight of the biennial gathering of chemistry educators from around the world at the International Conference on Chemistry Education. CCE TM Choon Do served as the organizing committee chair for the IUPAC sponsored 19th ICCE in Seoul, Aug 12 – 19, 2006. 342 participants from 37 countries gathered at Sookmyung Women's University in Seoul to address the conference theme "*Chemistry and Chemistry Education for Humanity.*" Full details are available at <http://www.19icce.org/19thICCE/19ICCEindex.html>.

A successful poster competition for 10 – 16 year old participants from around the world culminated in the display of some impressive works of art at the Seoul ICCE Conference. Students were asked to visualize "*the Importance of Chemistry for Humanity.*" The competition was organized by CCE's Lida Schoen and her colleagues at Science across the World. This is the second such collaboration between IUPAC and SAW, following a poster competition on the theme "It's a Chemical World" at the IUPAC General Assembly in Ottawa in 2003. Support for the 2006 competition was also provided by the Korean Chemical Society. 945 entries were received from 32 countries, and the quality was considered very high by the international panel of judges.

The 20th ICCE will be held August 3-8, 2008 in Mauritius, with a theme “*Chemistry in an ICT Age.*” The organizers have successfully applied for IUPAC sponsorship, put out a first circular, and identified several keynote speakers. To address the CCE condition that an ICCE conference must bring a substantial benefit to the region, a satellite conference is planned, likely in Nairobi. Organizers are also considering the possibility of virtual conferences for one day during the ICCE, in several locations in sub-Saharan Africa.

We have received several expressions of interest and one complete proposal to host the 21st ICCE in 2010, and a timeline will be developed by conference coordinator Warren Beasley, to ensure a fair and open process for selection of the next site by the time of the 2007 CCE meeting at the Torino General Assembly. The criteria that have been developed over the past several years appear to serve us well.

Finally, CCE is very concerned about the usurpation of the acronym “ICCE” by the recently established International Congress on Chemistry and the Environment, and we have so far unsuccessfully communicated our dismay to the conference organizer at the confusion this creates for chemists and chemical educators.

4. Other Significant Activities

- The **Young Ambassadors for Chemistry (YAC) program**, launched and sustained due to the enormous on-going efforts of TM Lida Schoen, is a partnership between CCE and Science Across the World. The main aim of the YAC project is to popularize and raise public awareness of chemistry by encouraging young students to act as ambassadors for chemistry. A train-the-trainers model is used to equip a group of teachers during four days to use the ready made Science Across the World resources to start international collaboration among students on chemistry related to every day life. YAC events have now been carried out in Taiwan, Argentina, Russia, and Korea, made possible due to generous co-sponsorship by GlaxoSmithKline for the overall program and the British Council for events in several countries. Consideration is being given to holding a YAC event in South Africa, and using this or another venue to initiate a more formal evaluation of the effectiveness of the program.
- **CCE continues to play a role in Educational and Outreach Dimensions to Collaboration Between IUPAC and OPCW**, with several projects spinning off of the 2005 Oxford Joint IUPAC/OPCW Conference on Education and Outreach Regarding Chemical Weapons (Project 2004-048-1-020). TM Natalia Tarasova has given leadership to project 2005-028-1-050, focused on the multiple uses of chemicals and codes of conduct. A forum for carrying this forward was provided by a conference on chemical education and responsible stewardship at Mendeleev University in 2005. Alastair Hay is the task group chair for project 2005-029-1-050 to develop educational material for IUPAC chemists and chemistry teachers about the Chemical Weapons Convention (CWC). The

material starts with the beneficial use of chemicals, and raises awareness about the possible misuses of chemicals, including the production of chemical weapons. Students are guided through the process of developing their own codes-of-conduct. Workshops with school teachers and university professors to pilot these materials have been held by Hay, Mahaffy, and Tarasova in Moscow (2005), Leeds (2006), and Seoul (2006), with follow-up dissemination scheduled for an OPCW meeting in September 2006 in Bologna. Plans are underway to convert materials into a web format and translate them into OPCW official languages. CCE expects to play a role in facilitating discussions within IUPAC about the ethical responsibility of chemists and the possible development of a Code of Conduct for IUPAC chemists, as well as the educational and outreach dimensions of future collaborations between IUPAC and OPCW. The CCE chair has been involved in all three projects listed above.

- **Network of Inter-Asian Chemistry Educators.** At the 2006 ICCE Conference in Seoul, a successful symposium and follow-up meeting was held to build a network of Asian Chemistry Educators. The group will meet again next year in Taipei, and is a good example of the benefits an ICCE conference can bring to a region.
- **Global Microscale Project** (Report to 2006 CCE Meeting by Ex-Officio CCE Member and Microscale Consultant, John Bradley)

As reported at the previous meeting of CCE in Beijing (August 2005), the pace of workshop activities has slowed due to decreased funding. However, during the reporting period, workshops under the auspices of IUPAC and UNESCO (plus other donors such as ISESCO), have been held in Malaysia, Indonesia, Denmark and Iceland. I conducted each of these, and found high interest, as is usual. On each occasion, DIDAC was also presented, either by Dr Pokrovsky (Malaysia, Indonesia) or by Prof Sydnes (Denmark, Iceland). The personal support provided by the Past President is very much appreciated.

The UNESCO website continues to add examples of worksheets supplied by the RADMASTE Centre covering chemistry, electricity, biology and primary science. These are slowly appearing in English, French, and Portuguese languages. They are freely available to all.

Under this project some 80 countries have now hosted workshops under the auspices of UNESCO. The workshops disseminate ideas, partly by providing hands-on experiences. The kits and chemicals used at the workshop remain in the country to enable further trial and reflection to take place there. However dissemination of kits is not the aim. The next workshop, under UNESCO/IUPAC/ISESCO auspices, is due to take place in Surinam in September, 2006.

- **Other Educational Projects** A complete list of CCE and other educational projects is available at http://www.iupac.org/standing/cce/cce_projects.html. In particular, we have a strong interest in working together with divisions and other standing committees on these activities.
- Having been nominated by IUPAC, I have been appointed to a new **ICSU committee on Freedom and Responsibility in the Conduct of Science**, which will hold its first meeting at ICSU headquarters in November. Under the aegis of the Executive Board, the Committee has both policy development and management responsibilities relating to the Principle of the Universality of Science. This encompasses the rights of scientists both to freely associate and to freely pursue their science and the responsibilities incumbent in these rights. Please pass on any suggestions about directions for this committee.

6. Communications

6.1 TM Masato Ito serves as editor of the CCE electronic newsletter Chemistry Education International (CEI), which facilitates communication about educational projects, activities, and outcomes of the ICCE conferences.

6.2 The vital role for IUPAC in the areas of chemistry education and enhancing public understanding and appreciation of chemistry has received excellent coverage in Chemistry International, and CCE is enormously grateful for the support in communicating this role by CI editor Fabienne Meyers.

Action Item:

As outlined by PUC Subcommittee Chair Tony Ashmore in 3.1.2 above, the report of project 2004-047-1-050, *“Public understanding of science: identifying IUPAC's niche”* was presented and favorably received in a workshop at the Beijing General Assembly. It has also been available for public comment on the IUPAC website, and profiled in Chemistry International. As called for in the project terms of reference, it comes to the Bureau at this meeting for approval (Item 12 of our agenda.)

We have also proposed the implementation of public understanding of chemistry initiatives by IUPAC in light of this report as one topic for a round table discussion in Torino, to be co-chaired by the chairs of CCE and COCI.

Appendix I: CCE Members

Titular Members - *tasks partition*

Prof. Peter G. Mahaffy (Canada)

Chairman

Prof. Eva Åkesson (Sweden)

Secretary - *Division Liaison*

Prof. Warren Beasley (Australia) - *Conference Coordinator*

Prof. Choon H. Do (Korea) - *Project Group Coordinator*

Prof. Masato M. Ito (Japan)

Prof. Ram S. Lamba (Puerto Rico)

Dr. Lida Schoen (Netherlands)

Prof. Natalia P. Tarasova (Russia)

Associate Members (Divisional Representatives)

Prof. A. James McQuillan (New Zealand)

Physical and Biophysical Chemistry

Prof. Leonard Interrante (United States)

Inorganic Chemistry

Prof. Gerrit J. Koomen (Netherlands)

Organic and Biomolecular Chemistry

Prof. Jean-Pierre Vairon (France)

Polymer

Prof. Roger M. Smith (United Kingdom)

Analytical Chemistry

Dr. R. Donald Wauchop (United States)

Chemistry and the Environment

Dr. Mukund S. Chorghade (United States)

Chemistry and Human Health

Prof. Richard Hartshorn (New Zealand)

Chemical Nomenclature and Structural Representation

National Representatives

Prof. Ludo Brandt

Belgium

Prof. Alvaro Chrispino

Brazil

Prof. Borislav Toshev

Bulgaria

Prof. Qiankun Zhuang

China/Beijing

Prof. Mei-Hung Chiu

China/Taipei

Prof. Terence N. Mitchell

Germany

Prof. Miklos Riedel

Hungary

Prof. Uday Maitra

India

Prof. Peter E. Childs

Ireland

Dr. Mordechai Livneh

Israel

Prof. Liberato Cardellini

Italy

Prof. Masahiro Kamata

Japan

Dr. Maryam Al-Wateed

Kuwait

Prof. Farzana Mahmood

Pakistan

Prof. Katrina Edström

Sweden

Prof. Philippe Boesch

Switzerland

Prof. Hale Bayram - *Project Group Member*

Turkey

Dr. Anthony D. Ashmore - *Project Group Member*

United Kingdom

Prof. Morton Z. Hoffman - *Project Group Member*

United States

Ex Officio

Mark C. Cesa (*COCI Representative*)

Prof. John D. Bradley

South Africa, Consultant for Microscale Project/Programme