

REPORT OF THE COMMITTEE ON CHEMISTRY EDUCATION, 2002—2003

The Committee on Chemistry Education (CCE) came into being at the beginning of this biennium and this is its first report to Council.

I HIGHLIGHTS

The committee has met once, at the 17th ICCE in Beijing in August 2002, where it established guidelines for the types of projects that it would seek to encourage in order to fulfill its terms of reference. It has decided to pursue the following criteria:

- I. Projects that contribute to the flow of ideas.
- II. Projects based on ideas that emerge within a country and are perceived to have regional or global significance.
- III. Projects that encourage curriculum development within a region , where local requirements have indicated a demand.
- IV. Projects that contribute to the distribution of good practice and information within a region, using the appropriate language.
- V. Projects strongly urged by Divisions and Standing Committees that have an educational dimension or are perceived as relevant to the public understanding of chemistry.
- VI. Projects that reach into regions that are currently under-represented in IUPAC activity.
- VII. Projects based on innovations within a country that are perceived by those outside the country as having potential regional or global significance.
- VIII. Projects encouraging inter-Union collaboration.
- IX. Projects that are innovative in the realm of the public understanding of chemistry .
- X. Projects that are a response to an explicitly demonstrable demand within a region or sub-region.
- XI. Projects that encourage collaboration between countries in a region or between regions (and sub-regions).

XII. Projects where IUPAC seed money is helpful to gain access to other sources of funding.

To facilitate the generation of projects, the CCE has established two subcommittees, the subcommittee on Chemistry Education for Development (CED) and the subcommittee on the Public Understanding of Chemistry (PUC), and appointed two chairmen, John Bradley and Peter Mahaffy, respectively. Projects are coordinated by Elisa Pestana, who is also Secretary of the CCE.

The CCE is responsible for the program of International Conferences on Chemical Education (ICCE). The 17th was held in Beijing in August 2002, the 18th will be in Istanbul in August 2004, and the 19th will be in Seoul in August 2006.

Special attention has been paid to the generation of links with other scientific unions and with COCI. There is now a representative of COCI on the CCE and COCI has established a small group to advise the CCE on items of mutual interest, particularly projects that COCI would regard as appropriate to its interests and which could be developed by the CCE.

II ACHIEVEMENT OF GOALS OF THE STRATEGIC PLAN

2003IUPAC will provide leadership as a worldwide scientific organization that objectively addresses global issues involving the chemical sciences.

The role of the CCE is to encourage good practice in chemical education worldwide and to promote the public appreciation of chemistry. It is playing a central role in providing assistance to developing countries and countries in transition, particularly through its collaboration with UNESCO and the propagation of its microscale experimental kits (see the CED report), and is organizing symposia to propagate chemistry to the general public (see PUS report). The CCE is encouraging the development of curricula that have regional relevance.

(b) IUPAC will facilitate the advancement of research in the chemical sciences through the tools that it provides for international standardization and scientific discussion.

The CCE regards research in chemical education as an intellectually valid domain of original investigation, and intends to encourage its acceptance.

(c) IUPAC will assist chemistry-related industry in its contribution to sustainable development, wealth creation, and improvement in the quality of life.

The CCE has established close relations with COCI, each committee having a reciprocal member and COCI having established an advisory group to guide CCE

towards industrially related projects that it would like to see developed. The CCE regards the propagation of sustainable development as a crucial component of its thinking, and is seeking ways to encourage its deployment in chemistry courses throughout the world.

(d) IUPAC will foster communication among individual chemists and scientific organizations, with special emphasis on the needs of chemists in developing countries .

The CCE has a huge membership, with a large number of NRs from developing countries. The Ottawa meeting of the CCE will include symposia at which NRs present summaries of what each of their countries need, and the CCE will build a program of projects based on this information. The involvement of the CCE with *Chemistry International* and its electronic counterpart *Chemistry Education International* is a major contribution to the propagation of information to developing countries.

(e) IUPAC will utilize its global perspective and network to contribute to the enhancement of chemistry education, the career development of young chemical scientists, and the public appreciation of chemistry.

This goal lies at the heart of the CCE, and all the activities of the CCE are directed towards its achievement. The goal cannot be achieved in isolation, and the CCE is establishing warm relations with the Divisions and Standing Committees.

(f) IUPAC will broaden its national membership base and will seek the maximum feasible diversity in membership of IUPAC bodies in terms of geography, gender, and age.

The chairman of the CCE seeks to involve a wide range of its members in its activities and planning. In the course of his travels he has encouraged a number of countries to consider membership of IUPAC.

III FUTURE SUBSTANTIVE INFORMATION

This part of the report consists of two summaries relating to the subcommittees of the CCE and its Project Committee.

PROJECT ADVISORY SUBCOMMITTEE This subcommittee was established under the leadership of the Project Coordinator (Prof E. Pestana) to facilitate the assessment of projects. It consists of the following members:

Project Coordinator ex officio, Chairman , Professor E. Pestana (Portugal)
Prof R. Bucat (Australia)
Prof R. Lamba (Puerto Rico)
Dr A. Ashmore (UK)

SUBCOMMITTEE FOR CHEMISTRY EDUCATION IN DEVELOPMENT (CED)

Inauguration and Composition of the Sub-committee

The subcommittee was conceived in the deliberations of the Education Strategy Development Committee (ESDC) that took place in the previous biennium. The recommendation to form the subcommittee was approved at the 41st IUPAC Council meeting held on 7-8 July, 2001 (Brisbane). It was born on 1 January, 2002 with Prof JD Bradley as its first chairman. The ESDC Report had outlined the proposed aims of the sub-committee, but it was clearly important and urgent to clarify these aims and to map its place and role within the new Committee on Chemistry Education (CCE). A CCE strategy meeting was held in New York in March, 2002, at which aspects of the committee's work were discussed. Also at this meeting the composition of the subcommittee was discussed and six possible members identified. An attempt was made to obtain a wide geographic distribution, with inclusion of prominent and active chemistry educators from developing countries and countries in transition. To achieve this spread it was also agreed to invite some members from countries that are not members of IUPAC. Following the meeting all invitees agreed to serve as follows:

Prof J Bradley (South Africa), Chairman
Prof R Lamba (Puerto Rico)
Prof N Tarasova (Russia)
Prof A Chrispino (Brasil)
Prof A Shoukry (Egypt)
Prof S Wandiga (Kenya)
Prof F Sevilla (Philippines)

Projects

The CED sub-committee inherited two major, active projects from the previous dispensation (CTC). Activities within these existing projects are first described.

1. Small-Scale Chemistry

This project has continued intensively in association with UNESCO (Basic Sciences Division). During this biennium several more countries have hosted introductory workshops, which introduce and advocate the benefits of small-scale chemistry practical work: Azerbaidjan, Botswana, Cape Verde, China, Congo (Brazzaville), Eritrea, Guinea-Bissau, Hong Kong, Latvia, Liberia, Mauritius, Morocco, Namibia, Seychelles, Sierra Leone, Sudan, Swaziland, Ukraine, and Uzbekhistan. A number of these countries, as well as those previously visited,

have been sufficiently inspired to establish pilot projects. These are designed locally to evaluate the application of the concept in the local conditions and in relation to the national curriculum. UNESCO has been very active and successful in soliciting funds from donor organizations to support the program. IUPAC has also approved a project supporting the program.

Alongside this workshop activity, the important task of translation of example worksheets into national languages also continues. Spanish and Uzbekh translations have been completed; the latter has been taken by Afghan translators to prepare Pushtu and Dhari language versions in anticipation of an intervention in Afghanistan.

The impact of the IUPAC-UNESCO Global Program is significant. Centres promoting small-scale methods (with particular reference to school education) are emerging spontaneously in a number of countries. Illustrative of the impact now perceptible in Africa at least, was the MINEDAF VIII Conference held in Dar es Salaam in December 2002. This triennial meeting of Ministers of Education in Africa, which covers all aspects of education policy, included an afternoon session on "Microscience Experiences", chaired by the Minister of Education of Cameroon. On this occasion Prof Bradley represented IUPAC, and addressed delegates on IUPAC and on the IUPAC-UNESCO Global Program.

Prof Wandiga is also active in East Africa promoting the concept in Kenya, Uganda, and Tanzania, from the Centre for Science and Technology Innovation in Nairobi. Prof Sevilla, a long-time promoter of cost-effective practical work in science, hosted a workshop in Manila at the University of Santo Tomas during 2002, and is planning further activities in his region.

A description of aspects of the Program appeared in *Chemistry International* (24, No3, pp 8- 10, 2002).

2. DIDAC

This project has also become a joint effort of IUPAC and UNESCO. It has also benefited from the very active support of UNESCO in soliciting funds and negotiating with Agfa Gevaert. This support has permitted the distribution of sample sets of resources in several countries, and the translation of the textual materials into a number of languages. Cost savings have been achieved by linking the presentation on the DIDAC resources and the personal delivery of these, with the holding of a small-scale chemistry workshop. As the financial and technical support of Agfa Gevaert is now being withdrawn, transfer of the rights to the materials to UNESCO is taking place. UNESCO, in cooperation with IUPAC, aims to distribute the material electronically for free use worldwide. The review and endorsement of DIDAC by COCI AND CTC in the previous biennium, is now bearing fruit on a global scale. The convening of a symposium on DIDAC within the program of the 39th IUPAC Congress, recognizes this global maturing of a project first conceived in Belgium to mark the 75th anniversary of IUPAC.

Once again we are indebted to UNESCO for so successfully assisting IUPAC in advancing “the worldwide aspects of the chemical sciences”.

3. IUPAC Periodic Table

The publication of a small laminated Periodic Table, to mark the 80th anniversary of IUPAC prompted the idea that something of this kind would have wide appeal in the world of chemistry education. Two possibilities were envisaged: it could either be a commercial venture, earning revenue for IUPAC, or it could be designed for free distribution. The evaluation of this concept and its formulation as a project are in progress.

Communication

Since the inauguration of CED there has been a meeting of CCE on the occasion of the 17th ICCE in Beijing. Unfortunately only two members of CED (Profs Lamba and Tarasova) were attending. Nevertheless the opportunity was taken to discuss on an informal basis the policy guidelines proposed for CED at the strategy meeting in New York. The chairman has also met on other occasions during 2002, Profs Wandiga and Sevilla. Electronic communication needs to be intensified in future.

Conclusion

The very significant benefit to CED of cooperation with UNESCO is clear, and we wish to record our gratitude to Dr Pokrovsky for his support.

SUBCOMMITTEE ON THE PUBLIC UNDERSTANDING OF CHEMISTRY (PUC)

The new CCE Subcommittee on The Public Understanding of Chemistry (PUC) has now begun its task of trying to identify the best way in which IUPAC can direct its efforts to build mutual trust and communication between chemistry and the general public. The subcommittee held its first informal meeting at the 17th International Conference on Chemical Education in Beijing in August 2002, where five of eight members who were able to attend set the direction for the Committee's work.

Subcommittee members are:

Prof Peter Mahaffy (Canada, Chairman)
Dr. Anthony Ashmore (UK)
Dr. D. Balasubramanian (India)
Prof Robert Bucat (Australia) Prof Choon Do (Korea)
Dr. Lida Schoen (Netherlands) Prof Joseph Schwarcz (Canada)

Prof Yoshito Takeuchi (Japan)

In its first year, the PUC subcommittee has focused on three activities:

Evaluation of public understanding

The subcommittee is preparing a proposal for an IUPAC project to map and evaluate existing public understanding of science efforts and propose a focus for PUC activities. Consistent with IUPAC's aims and goals, activities will probably be centred on facilitating communication among those responsible for on-going public understanding initiatives, and encouraging others to fill in the gaps that are identified. It is clear that much of the subcommittee's work will be done electronically, and the Internet will be an important tool in communicating what is being done. Professor Bucat <bucata@chem.uwa.edu.au> is coordinating the preparation of a project proposal.

Organization of symposia

The subcommittee is promoting discussion on the Public Understanding of Chemistry at the 39th IUPAC Congress, held jointly this year with the 86th Conference of the Canadian Society for Chemistry (session CE03 of the Congress, on Aug 14, 2003). On that date a series of three symposia featuring invited speakers will be held, focusing on various aspects of the public understanding of chemistry. Symposia titles are as follows:

- The Flow of Ideas Between Chemists and the Public Through the Media
- The Flow of Ideas from the Research Lab to Industrial or Public Use
- The Flow of Ideas Through Society

Poster competition

Younger chemists and citizens have brought a rich visual dimension to this topic by contributing to an international poster contest for 10–16 year old students on the topic *It's a Chemical World*. A distinguished panel of judges has agreed to accept the very difficult task of selecting winners from the 260 paper and electronic entries that have come in from students in over 20 countries. Select entries will be displayed throughout the Ottawa Congress and published in *Chemistry International*.

Miscellaneous The chairman attended the meeting of COCI at Sundsvall in 2002 and a meeting in Cairo in 2003 to inform himself about the 'systemic approach' to education that is being developed in a number of Arab countries and promoted by Professor Fahmi (NR, Egypt). He is also chairman of the Royal Society of Chemistry's IUPAC committee (and consequently a member of Council of the RSC), a member of the Royal Society's Scientific Unions Committee, leader of the UK's delegation to Council, and representing the Royal Society of

Chemistry at the World Chemistry Leaders meeting following Council. Over the next few months he is promoting chemical education at conferences in the USA, Brazil, Russia, Argentina, Viet Nam, Malta, Serbia, and Australia.

IV TABULAR MATERIAL

Members of the CCE

Membership of the committee is large, because the number of NRs is unlimited. The establishment is 8 TM and 8 AM.

Titular Members:

John Bradley	South Africa	Chairman of CED
Lida Schoen	Netherlands	
Elisa Pestana	Portugal	Secretary and Project Coordinator
Peter Mahaffy	Canada	Chairman of PUC
Peter Atkins	UK	Chairman
Ram Lamba	Puerto Rico	
Bob Bucat	Australia	
Yoshito Takeuchi	Japan	

Associate members:

Christopher Brett	Portugal (I)
Bernard Meunier	France (II)
Norma Nudelman	Argentina (III)
Jun-II Jin	Korea (IV)
Kip Powell	New Zealand (V)
Nicola Senesi	Italy (VI)
Mukund Chorghade	USA (VII)
Herb Kaesz	USA (VIII)

Representing COCI:

Luzius Senti	Switzerland
--------------	-------------

National Representatives:

Choon Do	Korea	Organizer, 19 ICCE
Józef Ziółkowski	Poland	
Alvaro Chrispino	Brazil	
Farouk Fahmy	Egypt	
Tony Ashmore	UK	
Borislav Toshev	Bulgaria	
Eduardo Villarreal	Argentina	
Eva Akesson	Sweden	
Françoise Rouquérol	France	
Helena Klímová	Czech Republic	
Hale Bayram	Turkey	Organizer, 18 ICCE
Juan Garringa	Puerto Rico	
Mariam Al-Wateed	Kuwait	
Masato Ito	Japan	Editor, CEI
Matti Näsäkkälä	Finland	
Mei-Hun Chiu	Taiwan	
Mordechai Livneh	Israel	
Natalia Tarasova	Russia	
Qiankun Zhuan	China	

Publications

None in the period of report

Projects in progress (*including interdivisional collaborations*)

1999-035-1-025 - Chemical education and sustainable development

2001-054-1-025 - Inter-Union meeting on education

2001-046-1-050 - Introduction of small scale chemistry experiments - teacher training

2001-045-1-050 - DIDAC worldwide

2002-021-2-050 - A feasibility study of the scope and limitation of machine translations as a means of disseminating useful reading material for chemical education to be used on the internet

2002-010-1-050 - Toward a core organic chemistry curriculum for Latin American universities

2001-016-1-050 - IUPAC chemical nomenclature for chemistry teachers at secondary schools

2001-003-5-050 - Organisation of Clearing House for the translation, publication, and dissemination of the IUPAC-sources materials and ideas in chemical education in Russia and CIS

2002-061-1 Frontiers of chemical sciences: research and education in Middle Eastern Countries (in association with the ACS)

2001-053-2-700 Fundamental Toxicology for Chemists

Projects in review

2003-008-1 Usage of computers as an educational tool in chemistry education and comparison with traditional methods

2001-044-1 Systemic approach in teaching and learning organic chemistry

2003-010-1 Alternative course of chemical thermodynamics

Peter Atkins
Chairman, CCE

June 2003