International Funding for Chemical Research

Science knows no international boundaries, but *funding* for support of scientific research is mostly provided by national organizations. This is particularly true for the chemical sciences, where most research projects are relatively small—not the mega-projects characteristic of high-energy physics, climate change, or biomedical research.

Three years ago, Arthur Ellis, Director of the Chemistry Division of the U.S. National Science Foundation, suggested to the U.S. National Committee for IUPAC that the Union might be able to convene representatives of organizations from several countries that support research in chemistry. They would explore the benefits of exchanging information and developing better mechanisms to encourage international research collaboration.

The result was an IUPAC project, organized by former Secretary General Ted Becker, that brought together a dozen participants in the one-and-a-half day Workshop on International Research Funding in the Chemical Sciences, held 18–19 August 2005, during the IUPAC General Assembly in Beijing. The agenda focused on:

- national research funding philosophies, conditions, and guidelines
- trends and priorities in chemical research
- tracking chemical research and measuring its impact
- programs in chemical research that encourage international partnerships
- resources that can be shared through international partnerships
- education and workforce in the chemical sciences

Particular attention was given to *ERA-Chemistry*, a program in Europe to develop cooperative research projects in different countries <www.erachemistry.net>, which may serve as a model for broader global cooperation. Other highlights included the use of mapping techniques to demonstrate the interrelation of various areas of science and their funding. Also of interest was the emerging discipline of cyber-enabled chemistry, which uses world-wide computer networks to permit remote control of instruments and to bring together a vast array of databases, modeling capabilities, and high-speed communications that can be used to attack chemical problems of great complexity. A report of the workshop is available at <www.iupac.org/projects/2004/2004-014-1-020.html>.

The participants, along with a number of others who could not attend the workshop, were eager to continue meetings and online interactions under IUPAC sponsorship. A follow-up project, recently approved by the Executive Committee, is designed to continue this communications forum for three years and to study the feasibility of a more permanent structure within IUPAC to facilitate the funding of international research in the chemical sciences by governmental and other organizations. Leaders in chemistry funding from more than 20 countries are being invited to a meeting on 29 August 2006 in Budapest, which will be held in conjunction with the 1st European Chemistry Congress. Tentatively, a second workshop will be held in Torino, Italy, during the IUPAC General Assembly in 2007.

For more information and comments, contact the task group chairman, Karlheinz Schmidt <Karlheinz.Schmidt@dfg.de>.

www.iupac.org/projects/2006/2006-013-1-020.html

Distance Learning in Toxicology: Effective Teaching through Technology

On 6 March 2006, a roundtable discussion about distance learning, especially as it pertains to toxicology, was held in San Diego, California, USA, at the 45th Annual Meeting of the Society of Toxicology (SOT). The roundtable, which was jointly sponsored by SOT and IUPAC, focused on the quality of a number of online offerings in toxicology.

One of the major frustrations felt by many educators who are engaged in distance learning in toxicology (or related disciplines) is the perceived lack of quality of such programs, which are often considered "diploma mills" (i.e., methods for making money with no real educational value). One objective of this roundtable discussion was to provide several examples of very high-quality distance learning programs in toxicology and to provide a forum for discussing how these programs were developed as well as their efficacy.

Five speakers presented their respective programs,

including John Morris (Drexel University, USA), Kristie Willett (University of Mississippi, USA), Jane Huggins (Drexel University, USA), John Duffus (Edinburgh Centre for Toxicology, UK), and Paul Wright (RMIT University, Australia).

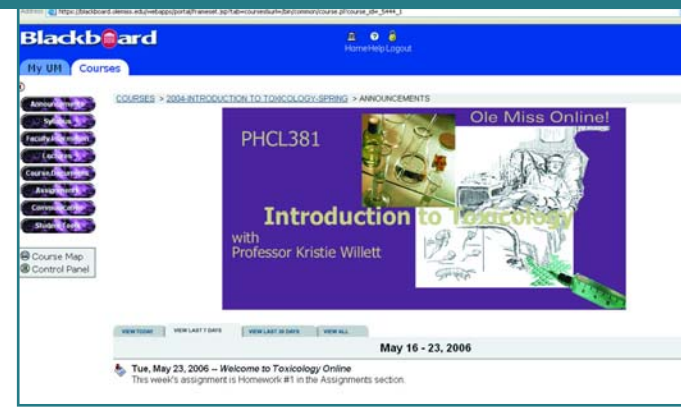
John Morris keynoted the session with his discussion of the many ways in which technology can be utilized for learning purposes. He highlighted the fact that effective distance learning endeavors recognize different teaching and learning styles and different levels of proficiency with electronic communication. He emphasized *engagement* of both student and teacher as integral to successful online education.

Kristie Willett presented her perspective on distance learning in toxicology, drawing from her experiences teaching toxicology online to undergraduate and graduate students. She put forth data from a series of surveys given to students while taking their online courses in which their experiences in both traditional and online environments were queried. Her results indicated that students value the opportunity to study online. However, these students exhibited a certain degree of ambivalence with regard to equating online courses with traditional face-to-face courses.

Jane Huggins described the series of online toxicology courses she has taught to undergraduate and graduate students as portals through which students can advance their understanding of the basic concepts of toxicology. She emphasized various features of WebCT® content management software, the electronic tool with which she teaches. Students in these courses are encouraged to engage in a range of activities utilizing chatroom, assignment, e-mail, and discussion group utilities. Moreover, students have access to a collection of audio/video materials including archived lectures and virtual seminars.

John Duffus presented a summary of IUPAC's teaching activities internationally in which online learning is utilized to a large extent via educational modules available on the IUPAC website. The main thrust of these teaching endeavors is to provide training in toxicology to chemists. Duffus, who participated in development of these modules, discussed their efficacy in teaching individuals from diverse backgrounds. He also talked about using glossaries to supplement the online teaching of technical disciplines, including toxicology.

Paul Wright discussed the fully online postgraduate programs he has developed for Graduate Diploma or Masters in Applied Science in Toxicology. He described stimulating the engagement of both student and teacher through use of online breakout groups and discussions, distance co-supervision of research projects for minor theses, use of learning journals and workplace practical applications, and other distance learning modalities. Moreover, he emphasized the international component of these programs, indicating that students from both developed and developing countries participate in them.



The homepage of the online toxicology course taught by Prof. Kristie Willett of the University of Mississippi (Ole Miss), USA.

Several presentations focused on the engagement of students participating in online courses, something that is often taken for granted in face-to-face, traditional classroom formats. However, both teachers and students find that engagement becomes a much more central issue when the usual visual and audio cues between teacher and student are not present, as is the case with many distance-learning endeavors. Many critics of distance learning have stressed that it severely limits the breadth and depth of expression between teacher and student. However, recent innovations allow audio and visual interactions between teachers and students, sometimes in real-time.

Two of the presentations in this roundtable discussion (John Duffus and Paul Wright) were about courses populated with international students. These talks highlighted a deeper issue related to distance learning: how to create a community in which individuals from many different cultures may participate. Online classes of any kind can rapidly become communities in which knowledge (and wisdom) is freely shared between teacher and student, or student and student. In fact, the boundaries between teacher and student often become blurred because everyone becomes engaged in the learning process. Although this phenomenon is

not unique to online courses, the argument can be made that because online courses are asynchronous, a community of greater breadth may evolve. This breadth is the result of the inclusive nature of asynchrony which allows individuals with many different time schedules and physical locations to engage in the learning process, adding depth and, at the same time, variety, to electronic classroom experiences. The phrase, "distance learning," can imply learning at a distance, but may also suggest closing that distance through shared learning experiences.

Overall, the roundtable discussion on distance learning sponsored by SOT and IUPAC provided an opportunity for exploration of the many issues facing individuals who are developing or taking courses online. All of the presentations exemplified the inspiration and perspiration that underlie any endeavor of this kind. If nothing else, these presentations provided evidence that, indeed, distance learning courses of quality do exist and thrive as do the teachers and students who participate in them. Further technological innovation will, no doubt, continue to support the development of community through distance learning and enhance the learning experience for all of us.

For more information and comments, contact the Task Group Chair Jane Huggins <dona.jane.huggins@drexel.edu>.

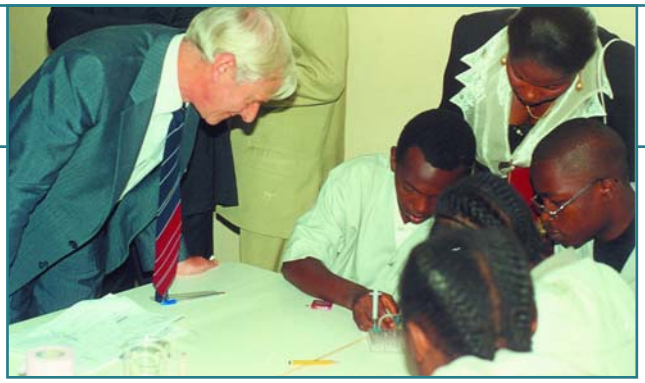
www.iupac.org/projects/2005/2005-013-1-700.html

Putting Experimentation Back into Science Education

Nearly a decade after the Global Microscience Project was launched by UNESCO and IUPAC in 1996, the microscience approach has been introduced into about 75 countries, many of them in Africa. In some countries, UNESCO-Associated Centres have been established to further develop the microscience project.

Prof. John Bradley headed this project for IUPAC for many years, and he remains deeply involved as a consultant for the microscale program for the IUPAC Committee on Chemistry Education.

The prime objective of this project is to introduce to teachers, inspectors, and education officials the advantage of performing chemistry experiments on a small scale. This is done through introductory workshops in developing countries and countries in transition where hands-on experience is provided under expert guidance.



Prof. Bradley (left) observing some students at a microscience workshop.

To supplement this initiative, teaching and learning packages, including teachers' guides and students' worksheets, are now available online thanks to the UNESCO Global Microscience Project, developed and promoted by UNESCO via its strong relationships with different nongovernmental and intergovernmental organizations throughout the world.

These Web pages contain microchemistry materials, soon to be followed by microelectricity, water quality, micro-electrochemistry, biology, and primary microscience resources. In addition, new materials as well as new language versions and national adaptations of existing materials will also become available on this site.

These materials are freely accessible by teachers and students to use as basic practical science resources. They can all be adapted easily to suit the needs of each national curriculum in accordance with national education standards.

For further information on the Global Microscience Project, contact UNESCO Coordination: Julia Hasler, programme specialist, SC/BES <j.hasler@unesco.org>. The technical partner is Beverly Bell <bellbct@radmaste.wits.ac.za>, executive director, International Foundation for Science Education, UNESCO-Associated Centre for Microscience Experiments, The RADMASTE Centre, University of the Witwatersrand, Johannesburg, South Africa.

www.iupac.org/projects/2001/2001-046-1-050.html

Cameroonian children carrying out experiments with the microchemistry kits.