

The International Commission on Physics Education (ICPE) Commission 14, IUPAP

Report of Activities during 2005-2008

Commission C14 has been proactively working towards the fulfillment of its objectives. The primary mandate of the Commission is to promote the exchange of information and views among the members of the international community of physicists in the general field of Physics Education including:

- ❑ collection, evaluation, co-ordination and distribution of information concerning education in the physical sciences at all levels;
- ❑ information relative to the assessment of standards of physics teaching and learning;
- ❑ suggesting ways in which the facilities for the study of physics at all levels might be improved, stimulating experiments at all levels, and giving help to physics teachers in all countries in incorporating current knowledge of physics, physics pedagogy, and the results of research in physics education into their courses and curricula.

Conferences

ICPE 2006: Towards Development of Physics for All, 13 to 18 August 2006, Tokyo.

This commission conference was organized at the National Olympic Memorial Youth Center in Tokyo with Professor Toshio Hyodo, University of Tokyo, as Chair. The main organizer was the Physics Education Society of Japan. In addition to IUPAP, the conference was also supported by the Physical Society of Japan, Japanese Society of Applied Physics, Association of Physics Education of Japan, British Council, and the Organization for Educational Development of the University of Tokyo. This was the second international conference on physics education held in Japan since 1986. The conference brought together 415 participants from 25 countries. Five parallel strands focused on Curriculum, Teachers Training, Teaching Materials and Teaching Process, Popularization, and other topics. In addition to the Plenary talks, oral presentations, special lectures and poster sessions, the conference organized several hands-on workshops, demonstration of hands-on experiments and a Science Show for Youth. One of the highlights was a special session for school teachers. The conference was preceded by an Active Learning Workshop organized by the Asian Physics Education Network (AsPEN) at the University of Kagawa.

Many professors of Japanese universities and technical colleges participated in ICPE 2006. This was an important milestone for Physics Education in Japan as this was not the case in the earlier conference organized in Japan 20 years ago. The organizers claim that in the intervening 20 years, the environment of physics education in Japanese universities and technical schools has changed drastically, and professors are becoming conscious of the importance of physics education. It is certain that this conference will have a tremendous influence on Japanese physics education research. Proceedings of the conference will be published electronically this year.

Details of ICPE 2006 are available at <http://www.komed.c.u-tokyo.ac.jp/ICPE2006/>

ICPE 2007: Building Careers with Physics, 11 to 16 November 2007, Marrakech, Morocco.

Organized by the Cadi Ayyad University of Marrakech, the Moroccan Society of Applied Physics and the Tunisian Society of Optics with Prof. Khallid Berrada as convener, ICPE 2007 was the first IUPAP-supported international conference on physics education in North Africa. It gave C14 an opportunity to reach out to a new geographical area and communities that have hitherto not been very active in the area of physics education and innovation. The conference attracted around 350 physicists, physics educators, physics education researchers and curriculum developers from 39 countries. Since there is no official institute on physics education in Morocco, the organization of the ICPE2007 was, both, a big challenge and also an opportunity to foster physics education in the host country. The conference was sponsored “under the high patronage of His Majesty the King Mohammed VI.” This patronage for an academic conference is very rare. The conference had a very strong program with presenters from throughout the world. It was highly successful in giving a boost to Physics education, particularly to the engagement in educational reforms of Morocco with the Maghreb countries. Our only disappointment was that the conference attracted very few participants from sub-Saharan Africa, a region the commission wants to proactively reach out to.

The broad sub-themes of the conference were New Job Opportunities; Effective Teaching Strategies; Learning with Technology; Physics for Sustainable Development; Bridging the Gaps; and Women and Girls in Physics. Participants shared their experiences in the physics teaching-learning process in general, and in developing career-oriented curricula and enriching the professional skills of graduate students. Inasmuch as C14 has in recent times been focusing on how to enrich Physics education in developing countries, creative experiments with “low cost” or “no cost” materials were mixed judiciously with examples of learning with high-tech equipment. The conference presented several science caravans and other outreach activities to demonstrate how physics experiments can be adopted in rural areas with local resources. In addition to multitude of national projects, the conference also presented coordinated large scale projects in collaboration between the UNESCO and ICPE aiming to make physics and science education available to everyone. A special session was devoted to Women in Physics wherein data from several countries were presented.

On the sidelines of ICPE 2007, the French Association of Optics and Photonics (AFOP) organized an international exhibition for two days dedicated exclusively to physics and education. Many exhibitors participated in the conference. The list includes *Didalab*, *Horiba Jobin-Yvon*, *IDIL Fibres Optiques*, *Institut d’Optique*, *PYLA*, *Quantel* from France; *PHYWE Instruments* from Belgium; and *PASCO Scientific* from USA. In this exhibition a special stand was dedicated to SPIE (International Society for Optical Engineering). The companies elicited excellent response from the participants and offered sponsorship for training programs in optics and photonics.

Details of ICPE 2007 are available at <http://www.icpe2007.org/>.

IX Inter-American Conference on Physics Education: Teaching Physics in the New Millennium, 3 to 7 July 2006, San José, Costa Rica.

The Inter-American Conference on Physics Education (IACPE) is a traditional meeting, promoted every 3 years, by the Inter-American Council of Physics Education. The 9th meeting was organized by members of the Physics Department and the School of Teacher Education of

the Universidad de Costa Rica, and supported by the Physics Department of the Universidad Nacional, the Science Department of the Universidad Estatal a Distancia (University for Distance Learning), the Latin-American Center of Physics (CLAF), the Ministries of Science and Technology, and of Education.

The goal of the Conference was to explore new ideas for the teaching of physics with virtual and electronic instrumentation equipped laboratories for the education and development of physics teachers. About 100 delegates (mainly physics educators) from 14 countries attended with 22 of these delegates coming from Costa Rica. The number of papers presented at the conference was more than one hundred, organized in six themes: The preparation of physics teachers; Teaching Physics to professionals in related fields; Relation between physics, other sciences, technology and society in the teaching of physics; Informal learning of physics and the use of appropriate techniques and technologies; Teaching of physics in non university levels; and Research in the teaching of physics and other sciences in the classroom revealed similar problems in many countries. Some effort is being made to share teacher education materials. Details are available at www.efis.ucr.ac.cr/varios/ixconfenfisica.htm

Conferences Endorsed

The commission endorsed the following conferences although these were not financially supported by IUPAP:

GIREP 2006 Modeling in Physics and Physics Education, Amsterdam, 20 to 25 August 2006.

The local organization was taken care of by the AMSTEL Institute of the Faculty of Science, Universiteit van Amsterdam. A conference details are available at <http://www.girep2006.nl/>

Frontiers of Physics Education Rijeka/Opatija, Croatia, 26-31 August 2007. This saw a merger of the GIREP-seminar and European Physics Education Conference (EPEC). A primary effort of EPEC was to bring together physicists and physics educators. About 225 participants attended the conference. Topics of the conference included both fundamental physics research, physics education research and teaching. More information is available at <http://www.ffri.hr/GE2/>

Physics Curriculum Design, Development and Validation, 18 to 22 August 2008, Nicosia, Cyprus. This was organized by the International Research Group on Physics Teaching (GIREP). The ***13th Workshop on Multimedia in Physics Teaching and Learning (MPTL)*** was also held alongside. For those familiar with the political situation in Cyprus, the following statement by the conference organizers would be of interest: "For people traveling from Turkey, we recognize that this is very cumbersome. For this reason the GIREP committee decided to offer reduced registration fees." Details are available at <http://www.ucy.ac.cy/girep2008/index.htm>.

Future Conferences

ICPE 2009: Development and innovation in Physics Education, 18-24 October 2009, Bangkok, Thailand. This will be jointly organized by the Thai Physics Society, Chulalongkorn University, Mahidol University, and Science Society of Thailand. The sub-themes of ICPE2009 are: Bringing physics education into the 21st century; Engaging physics education to the real

world; Developing new and effective learning approaches for physics education; and Preparing physics education to provide solutions to global challenges. Conference details will soon be available at <http://www.icpe2009.net>.

InterAmerican Conference on Physics Education, 6-10 July 2009, Medellin, Colombia.

Planning on this conference is underway.

ICPE 2010: The commissions conference in 2010 will be held from in Mexico City in 2010. The title and sub-themes will be announced shortly.

Meetings of the Commission

The annual meeting of ICPE is usually held on the sidelines of one of the commission supported conferences. In the last three years, meetings were held in Tokyo in 2006, Marrakech in 2007 and Nicosia in 2008. At the host conferences, several of the commission members were invited speakers, gave contributed talks, presented workshops, posters or were session chairpersons. In addition, as has been common practice, several ICPE members served on the international organizing committees and thus helped in the planning.

A new feature of our commission meetings is that all the members make a brief presentation on a select aspect of physics education in their country and their own work. This is leading to a better global understanding of problems faced, diverse physics education systems and praxis.

Publications

The ICPE Newsletter. This continued to be produced regularly twice a year in April and October. Ian Johnston, Professor Emeritus, University of Sydney, took over as Editor of the Newsletter in October 2005 when Vivien Talisayon, associate member from Philippines, resigned after an excellent innings. The Newsletter is primarily disseminated in electronic form. A small number of copies are also printed and distributed at conferences. Issues dating back to 1995 are available at the commissions website.

Connecting Research in Physics Education with Teacher Education, Volume 2. The second volume of our publication *Connecting Research in Physics Education with Teacher Education*, with Matilde Vicentini (member C14 1999-2005) and Elena Sassi (member C14, 2005 onwards) as editors, is ready for distribution in electronic form. We plan to print about one thousand copies for distribution at conferences and workshops to those from developing countries that have poor access to internet and electronic resources. The first volume is still available at the primary site <http://www.physics.ohio-state.edu/~jossem/ICPE/TOC.html> and continues to be accessed.

Website: The Commission's website is being maintained by Dean Zollman at <http://web.phys.ksu.edu/> All our reports and publications are available at this site and we maintain a record of the statistics of hits. These indicate that the interest in our publications continues to be high.

Working Groups

The following working groups have been actively engaged in furthering our mission objectives:

- ***Collection of information about physics teacher education degree programs at various universities around the world*** (Talisayon – chair, Alarcon, Luo, Pietrocola). The preliminary report of the study was presented at ICPE 2006 in Tokyo as a plenary talk.
- ***Increasing participation of school teachers in physics education meetings*** (Pietrocola – chair, Zollman, Schlichting, Dissanayake). As a result of the efforts of this group, for the first time at an ICPE conference, a workshop titled *School Teachers' Session* was organized at ICPE 2006 in Tokyo wherein specially invited school teachers from Japan, Brazil, and Korea exchanged their experience and ideas on Physics Education. The participating teachers were encouraged to explore the possibility of establishing an international network among school teachers. We plan to continue this effort by organizing special events for school teachers at each conference.
- ***Collating publications on physics education research*** (Jolly – chair, Zollman). The group will identify select resources of seminal importance for use by physics educators worldwide and the best mode of dissemination. Efforts are underway to collect and make available the earliest ICPE publications in electronic form.
- ***State, Standing and Recognition of Physics Education Research around the World*** (Lamboune – Chair). Based on comments by several members of the commission on the dismal standing and support for physics education research in several countries, the commission is looking forward to collecting data that can form the basis of recommendations for policy change.
- ***Seven Wonders of Physics and Technology Contest*** (Johnston – Chair, Pendrill, Berrada). The commission plans to organize outreach events that elicit world wide participation of physicists, physics educators at all levels, and most importantly, students and public at large. This contest was a step in this direction. Many physics discoveries have truly changed the way we live and the way we view our world and the universe. Yet the Seven New Wonders of the World, announced in July 2006, did not include any modern technological developments. The commission proposed to establish a new list of seven physics-related technological wonders of the world. It launched a survey for selection of Seven Wonders of Physics, mediated by a web-site and on-site polling. Participants were asked to choose from a list of 21 possible items, seven which had changed, or were changing, the way we live today. The final poll included the participants at ICPE 2007 at Marrakech, where the results were announced. The popular vote was for World Wide Web; Nanotechnology; Satellite communication; Medical and industrial imaging; Transistors; Lasers; and Wireless communication.

Implementation of WCPSD Physics Education Action Plans

One of our concerns has been to involve those in developing countries and help strengthen physics education in culturally relevant ways. As the action plans that emerged from the IUPAP-UNESCO-ICTP *World Conference on Physics & Sustainable Development*, 31 October 31 to 2 November 2005, Durban, South Africa, are in consonance with the commission goals, we are working closely with the coordination committee constituted by the sponsors of WCPSD (IUPAP-UNESCO-ICTP) for their implementation. For ease of reference the action plans are listed below:

1. To give educators and students in developing countries access to high quality physics education resources by establishing a website and *Physics Education Resource Centres* in Africa, Asia and Latin America.
2. To develop supplemental instructional materials for secondary physics courses that help students understand how the mastery of physics concepts can enable them to contribute to sustainable development in their own countries.
3. To develop model workshops for teacher-trainers in Asia, Latin America and Africa that exemplify how active learning methods can be adapted to help meet the needs of students in developing countries.
4. To establish a structured multi-disciplinary mobile science community that provides support to mobile science practitioners, enabled by a web and internet site at www.mobilesience.info hosted by the Institute of Physics (UK).

Our commission is proactively participating in the efforts of the Coordination Committee for the implementation of plans 1-3.

Active learning workshops: Within the framework of the UNESCO program for basic sciences, since the WCPSD, some of the members of our commission have collaborated in the organization of the following workshops on Active Learning in Optics and Photonics (ALOP):

- Third UNESCO Workshop on Active Learning in Optics and Photonics ALOP 2006: Faculty of Sciences Semlalia, Cadi Ayyad University, Marrakech, Morocco, 23-28 April 2006.
- Fourth ALOP Workshop: Miranda House, University of Delhi, 6 to 11 November 2006.
- Fifth ALOP Workshop: Dar Es Salaam University, Tanzania, July 2007.
- Sixth ALOP Workshop: Universidade de São Paulo, Brazil, 22-27 July 2007. Participants and International Observers included those from Brazil, Uruguay, Argentina, Chile, Mexico.
- Seventh ALOP Workshop: Leon Guanajuato, Mexico, 6-11 November 2007. Participants from Mexico, Venezuela, Guatemala, Nicaragua, Colombia, Peru,
- Eighth ALOP Workshop: Argentina.

(The first ALOP Workshop was held by UNESCO at Ghana in November 2004 and the second at Tunisia in March/April 2005.)

PHYSWARE: A collaborative workshop on low-cost equipment and appropriate technologies that promote active learning in physics throughout the developing world. As a follow-up to the World Conference on Physics and Sustainable Development, three members of C14, Pratibha Jolly, Elena Sassi and Dean Zollman, working with Priscilla Laws submitted a proposal for a Workshop at the Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy. The first Workshop will be held from 16 to 27 February 2009. This workshop will be the first ICTP sponsored workshop to focus on issues related to the teaching and learning of physics. The thrust will be on the design of low-cost equipment and computer tools; active learning materials; and development of strategies for using them effectively to enhance the teaching of Newtonian mechanics. The participants will be university teacher trainers, instructors who teach introductory physics courses at the university level, and a outstanding secondary school teachers with expertise in low-cost equipment design. The details of the workshop are available at: http://cdsagenda5.ictp.trieste.it/full_display.php?ida=a07137

Awards

The ICPE Medal. The commission instituted in 1979 a medal to commemorate outstanding contributions to physics teaching is given every one or two years.. According to stipulations, the ICPE medal recipient should have fulfilled two criteria. One, the contributions to physics education should have extended over a considerable number of years; and two, the contributions should be international in their scope and influence. The laureates during the period of report are:

- 2006: Jon Ogborn, United Kingdom; presented at ICPE 2006 conference at Tokyo.
- 2007: Priscilla Laws, United States; presented at ICPE 2007 conference at Marrakech.
- 2008: UNESCO; to be presented at ICPE 2009 conference being organized at Bangkok because of the travel schedule of the Assistant Secretary General, Natural Sciences, who will receive the award on behalf of UNESCO.

The citations for all laureates are available at the commission website.

Young Scientist Award. Because education is context and culturally dependent, C14 took some time to develop the criteria for the Young Scientist Award. The criteria and procedures were finalized this past summer and will become effective after the IUPAP General Assembly. The C14 Young Scientist Award will be based on a paper which is submitted to an ICPE supported conference. Research will include educational development such as development of instructional materials as well as physics education research. The impact of the research and/or development will be judged in the local context of the applicant. The paper should have been accepted by a refereed journal prior to the conference for which it was submitted. All physics educators who meet the basic criterion on being within eight years of their PhD (excluding career interruptions) are eligible. Research in areas other than physics education will not be eligible. Very wide distribution of the Call for Nominations will be made. Research and development experiences in informal education will be considered equally with those based on work in formal settings. For formal education there will be no restrictions on the grade level at which the research was conducted.

We have proposed that the application for the Prize should include the paper on which the application/nomination for the Prize is based, in its original language and a summary in English. Additionally, because we recognize that some cultures are more familiar with format and content of letters of recommendation than other, we will provide templates for the CV, summary; and letters of recommendation.

Links to Scientific Bodies

C14 has proactively fostered and strengthened links to many different organizations – both global and sometimes regional in character – with aims wholly or partly identical to those of our Commission. Highlights of actions taken in this direction during the last three years are:

- **UNESCO:** The ICPE 2008 medal has been awarded to UNESCO to honor the proactive relations with UNESCO since the inception of the commission. A UNESCO official is a C14 associate member. UNESCO continues to fund the publication of our Newsletter. Particularly rewarding has been the cooperation in organizing the *World Conference on Sustainable Development* at Durban in October 2005 and collaborative efforts in implementation of the action plans that have led to organization of several *Active Learning Workshops* in the developing world.
- **GIREP:** In several conferences and seminars of this group, ICPE members have been given main roles in the planning. GIREP facilitated the annual meeting of the commission this year. C14 and GIREP executives keep each other well informed about the activities of respective bodies. A task group has been setup to explore areas of collaboration in addition to organization of conferences.
- **EPS:** As mentioned earlier, EPS joined with GIREP to sponsor a conference on Physics Education in Croatia in 2007. Our Commission was represented by several members. One of our commission members is also the current chair of the EPS Physics Education Division while another is member of the board. At the recently concluded GIREP conference in August 2008 at Cyprus, a special session was devoted to discussing closer cooperation between the various organizations, especially the EPS-PED.
- **EUPEN and STEPS:** Although the former thematic network has now ceased its activities, the follower STEPS (Stakeholders Tune European Physics Studies) and our Commission will be in close contact in the future.
- **AAPT/APS:** Several personal links between C14 members and these organizations make it easy to keep information channels open..
- **AsPEN:** The Asian members of the commission currently also serve as national points of contact and are on the executive board of AsPEN. They have contributed towards organization of Active Learning Workshops in the region. The former President of AsPEN is currently an associate member of the commission.
- **LAPEN:** Our commission members from Latin America took the lead role in the creation of the Latin-American Physics Education Network, taking inspiration from similar

networks throughout the world. The main objective was to coordinate projects and to establish links between existing groups working on Physics Education in different countries of the region. To further strengthen the bonds with LAPEN and physics education in the region, our associate member from LAPEN will organize our conference in Mexico City in 2010.

- **ESERA:** The European Science Education Research Association, although not specially established for physics, is very active and organizes conferences on a regular basis.

Recognizing the need for more closely coordinating the activities of the various national and international groups which focus on physics education, this summer we formed a sub-committee. The subcommittee membership is three members of C14 and the President of GIREP.

Concluding remark

On behalf of our Commission I would like to express our gratitude to the IUPAP Council for generous support for our activities during the period 2005 – 2008.

Pratibha Jolly, Chair C14
October 1, 2008
Email: pratibha.jolly@gmail.com