

ICPE Chair's Corner

In the last issue I asked: How do we mainstream innovations in physics education? What is the process by which a successful pedagogical innovation can be transferred from the precincts of the developer's laboratory or institution to a wider international group? These questions were triggered by the success of the pilot *Physware* Workshop we conducted at the Abdus Salam International Centre for Theoretical Physics (ICTP) in February 2009 at Trieste and the quest for mechanisms to keep the effort alive.

Six months later, I am happy to report that IUPAP and ICTP have signed a formal agreement to cooperate in organization of the *Physware* series of *Educate the Educator* Workshops over the next five years. The agreement emanates from a shared understanding of the critical need to strengthen initiatives for capacity building of physics educators, especially in the developing world. Modeled after the pilot workshop, the *Physware* series will address physics topic areas, low cost equipment and appropriate technologies that can be incorporated into introductory physics courses at the tertiary level. They will also provide ways to integrate topics in contemporary research or applications of these topics thereby introducing participants to teaching fundamental new physics within the context of contemporary pedagogy.

The goal will be to hold one workshop in odd years at ICTP and in a suitable developing country in the even years. Our commission will be responsible for coordination. Each year, representatives of ICPE and ICTP, jointly with others as desired, will meet to discuss the organization of the *Physware* Workshop for educators from developing countries. They will discuss funding, venue, organization, experts and resource persons and participants. For the workshops to be held at Trieste, ICTP will make an in-kind contribution to be determined at the joint meeting of the representatives of ICTP and ICPE. ICTP will also assist in drawing local support from other institutions and organizations in and around Trieste for those workshops. These workshops will leverage the facilities and expertise in fundamental and emerging physics research available at ICTP, including the facilities and expertise of the Multidisciplinary Laboratory and the Science Dissemination Unit. For the workshops to be held outside Trieste, ICTP will provide institutional contacts for hosting workshops in developing countries and use its resources to provide proper publicity for events. These

workshops will focus on innovative physics teaching using contexts of specific relevance to the development of the host region.

The agreement also reiterates the common interest IUPAP and ICTP have in disseminating information which improves physics research and education, especially to scientists in developing countries. (*Continued page 8*)

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In Memory of E. Leonard Jossem



Dr. E. Leonard (Len) Jossem passed away Saturday, August 29, 2009. Dr. Jossem served the International Commission on Physics Education both as its Secretary and as its Chairman (1981-1993), and was awarded the Medal of the Commission in 1995. He was also an editor of several ICPE books.

Pratibha Jolly, current chair of ICPE noted, "I enjoyed his deep understanding of cultures and fondly recollect his insightful mails on Indian poetry and literature. Len will be missed for his commitment to the global community of physics educators, his words of wisdom and his friendship towards all."

Dr. Jossem was a consultant for UNESCO projects in Thailand, and a consultant for the World Bank-Chinese University Development Project in China. He held honorary professorships in Physics at Beijing Normal University, at Beijing Teachers College, and at Southeast University in Nanjing, China. Deeply involved in International Physics Education, he was recognized on his 70th birthday in an International Newsletter on Physics Education article, "He moves among students and teachers as naturally as among professors and Nobel laureates. To have a teaching career with such a fresh innovative spirit during half a century is a privilege only a few can enjoy."

Born in Camden, NJ on 19 May 1919, Dr. Jossem received his B.S. in Physics from City College of New York in 1938. During World War II he was a member of the scientific staff at Los Alamos in the Advanced Developments Division. He received his master's degree in 1939 from Cornell University. His Ph.D., also from Cornell University in 1950, was for his research on experimental condensed matter physics. His long and productive career included nine years on the faculty at Cornell University, and two years with the commission on College Physics.

Joining the faculty of the Department of Physics in The Ohio State University in 1956, he continued his research in experimental condensed matter physics and was responsible for building the advanced

undergraduate physics laboratories in the department. He taught at OSU for thirty three years, serving as Chairman of the Physics Department from 1967-1989 till he became Professor Emeritus in 1989. The department is well known for its efforts in insuring that all graduate students are introduced to and schooled in the good practices of exemplary teaching. This program is part of the legacy of Len Jossem.

Jossem was a fellow of the American Association for the Advancement of Science, the New York Academy of Sciences, the Royal Academy of Arts, and the Institute of Physics [London]. He held the Howard E. Maxwell Award for Distinguished Service to the Ohio Section of the American Physical Society.

An active member since 1948 and past president of the American Association of Physics Teachers (AAPT), Jossem continued to serve on several of its committees till the very end. He was a member of the Committee on the Teaching of Science of the International Council of Scientific Unions, and of the UNESCO-Physics Action Council Working Group on University Physics Education. He received the AAPT Distinguished Service Award in 1970, the Melba Newell Phillips Award in 1985, and the Oersted Medal in 1994. In presenting the medal, James H. Stith noted, "Leonard Jossem is a master teacher and educator in the broadest sense of the word."

Long interested in physics education, his activities include service as Staff Physicist and Executive Secretary of the Commission on College Physics from 1963 to 1965. He served as the Chairman of the Commission from 1966 to 1971, during which time the commission's work fundamentally changed the way physics was taught in the United States. He also served as a member of the Board of Directors of the Michigan-Ohio Regional Educational Laboratory (1967-69); the U.S. National Advisory Committee on Education Professional Development (1967-70); the Council of the American Association for the Advancement of Science (1967-70); and the Physics Survey Committee of the National Academy of Sciences/National Research Council (1967-1970).

On hearing of Len's death, Minella Alarcon, Senior Programme Specialist for UNESCO stated, "Len Jossem was a good friend of UNESCO and its physics education networks. Among much else, he will be remembered for keeping and sharing databases of physics teaching and learning materials."

"The world's physics teaching society has lost one of its pioneers, and the Chinese physics teaching community has lost one of our old friend and best collaborator", said Nian-Le Wu Nianle Wu, professor at Tsinghua University in Beijing China and a newly appointed member of ICPE.

(Some material taken from an AAPT news release. http://www.aapt.org/aboutaapt/upload/..._JossemPressRelease.pdf)

A long tradition of in-service training for physics teachers by the German Physical Society

Michael Vollmer, <vollmer@fh-brandenburg.de>

University of Applied Sciences Brandenburg, Magdeburgerstr. 50, 14770 Brandenburg, Germany

Volkhard Nordmeier

FB Physik, FU Berlin, Arnimallee 14, 14195 Berlin, Germany

In Germany, in-service physics teacher training is offered by a variety of people and institutions, and so far as content is concerned, it covers a very wide field. On the one hand, there is a focus on didactical and pedagogical aspects of physics teaching or empirical studies of learning; on the other hand, in-service teacher training focuses on the subject matter of physics. The latter aspect is motivated by the goal that physics teachers should stay up-to-date with modern developments in physics and technology in our rapidly changing technological world.

Obviously content-based physics teacher training should be given by experts close to physics research and development — and such experts are usually working at university physics departments, or other big research institutions or in industrial research laboratories. Unfortunately, these institutions are spread widely all over the country. Therefore, besides the numerous regional physics teacher training seminars, held annually in Germany, it is very helpful, that the German Physical Society (DPG) already decided, more than 25 years ago, that such content-based physics teacher training should also be organized nationwide as week long courses; and — most important — that they should be financially supported.

Obviously, regular week-long activities require some kind of meeting place which was then becoming available at the DPG Physikzentrum in Bad Honnef (www.pbh.de). This center was founded in 1976 with the goal to provide a conference and meeting venue for the physics community, with the ability to provide overnight accommodation and meals. Since then, tens of thousands of participants (at present more than 5000 per year) have enjoyed scientific conferences and workshops, physics schools for students and young researchers as well as in-service physics teacher training courses. In addition, the building is also the headquarters for the DPG, which also holds its annual 3-day conference discussing future activities and important issues of the society.

A few years after founding the center, the DPG launched the first of a long series of in-service physics teacher training seminars at the physics center. The very first (and very successful) seminar dealt with an ever modern hot topic: the physical basis for energy sources, its forms, transformations and uses. Shortly afterwards, a scheme for such teacher training

seminars was developed. These have been working now for more than two decades. The DPG supported two courses per year, each for a period of five days, typically for between 40 to 80 participants, which focussed on up-to-date topics in physics, as well as the relationship between physics to other disciplines.

These courses are usually organized by two directors, one being involved in the physics discipline of the course, the other one from the field of physics education. Up to 16 lectures/courses are scheduled as two hour sessions, about two thirds dealing with the physics aspects and about one third dealing with physics education related issues — like for example, concepts of how to teach this topic in a school classroom. Each session offers ample time for discussions, since speakers only use about 75 minutes for their presentation and another 15 minutes for discussions. After each speaker, there is at least a 30 minute break, stimulating more discussions. Although the directors may, and often do, contribute themselves, external experts from all over Germany are invited to come to Bad Honnef and also stay for several days, if possible the whole week, with the teachers. This allows additional interactions and stimulating discussions also during social gatherings in the evening hours in the comfortable wine and beer cellar of the Physikzentrum.

A growing number of contributions show experiments which are usually enjoyed a lot by participants (see Fig. 1).



These opportunities were enhanced even more after a new lecture hall was built (Fig. 2) which now

allows seminars with up to 100 participants, the limit being mainly due to accommodation problems.



Some titles of teacher training seminars of the last few years were elementary particle physics, cosmology and astrophysics, quantum mechanics and quantum phenomena, nonlinear dynamics, spectroscopy, lasers, solid state physics and superconductivity, theories of relativity, sensors, nanophysics, but also topics beyond physics alone, like medical physics, energy and environment, natural phenomena, biophysics, physics and sports, physics and music, physics of the earth, meteorology, history of physics or renewable energies.

At the end of each course, the participants evaluate the course and suggest new topics for future courses. Not unexpectedly, the teachers particularly enjoy the possibility to directly communicate with experts, also during the meals (Fig. 3), breaks and in the evenings.



This aspect is of course well known by scientists, but is similarly important for physics

teachers. Another very important aspect contributing to the success of these seminars is the physics center itself with its ambience: the whole group of teachers stays in the building, sharing all meals but there are also social activities, like walks to the Rhine river or in the nearby hills.

Due to the great success of these teacher training seminars, and seeing the necessity to provide a life long learning platform for physics teachers, the activities were intensified a few years ago. At present, the DPG organizes three week-long courses for physics teacher in summer and fall, as well as another course for young teachers. In addition, The Wilhelm and Else Heraeus foundation usually supports a fifth course in fall for teachers in the transition phase from university education to professional teaching at school. This means, of course, more organization and more people involved. The DPG has named two people to organize this program (at present Volkhard Nordmeier/Berlin and Michael Vollmer/Brandenburg) by finding topics, looking for course directors and analyzing the evaluation of the courses. In order to help new directors, a handout (kind of a manual) was developed with information of how to organize such courses and how to recruit speakers, including a provisional time scale for the preparation as well as a time schedule for the course itself. .

As an example of the diversity of the present program, the courses for 2009 and 2010 are listed:

- | | |
|--------------|---|
| 6.-10.7.09 | High energy and accelerator physics |
| 13.-17.7.09 | Cosmology |
| 23.-27.10.09 | History of physics |
| 18.-20.11.09 | Ideas and concept for modern physics teaching (course for new teachers with less than 5 years of teaching experience) |
| 23.-27.11.09 | Physics and technology yesterday, today and tomorrow
WEH-meeting for teacher students in final year and beginning teachers |
| ----- | |
| 28.6.-2.7.10 | Natural phenomena in physics |
| 26.-30.7.10 | Environmental physics |
| 22.-26.10.10 | Physics and music |
| 16.-19.11.10 | Course for new teachers with less than 5 years of teaching experience |
| 11/ 2010 | WEH-meeting for teacher students in final year and beginning teachers |

Citation for the Presentation of the ICPE Medal

to

Professor A. L. (Ton) Ellermeijer
University of Amsterdam, The Netherlands

Bangkok, Thailand

October 2009



In 1979, the well-known researcher in the field of physics education, George Marx, proposed to institute a medal to recognise “outstanding contributions to physics teaching of a kind that transcends national boundaries”. The first award of the medal was made in 1980 to Professor Eric M. Rogers, the awarding ceremony taking place during the Trieste Conference on Education for Physics Teaching.

At the ICPE2009 conference in Bangkok, the 2009 medal was awarded to Professor Anton (Ton) Ellermeijer for “long and distinguished service to physics education”. It was presented by the vice-chair of ICPE, Professor Robert Lambourne Jolly, who delivered the following citation.

Ton Ellermeijer, Professor at the University of Amsterdam and Director of the AMSTEL Institute, is awarded the ICPE Medal in recognition of his significant contributions to the teaching and learning of physics. His distinguished career has included many research and development activities which have had international impact on scientists, educators and the teaching of science.



Professor Lambourne presents the medal to Professor Ellermeijer at the ICPE conference in Bangkok

Dr Ellermeijer completed a Masters in Nuclear Physics from the University of Amsterdam. After a few years as a high school teacher he entered the Free University of Amsterdam and completed a doctorate in Physics Education. He now holds a chair of the

Dutch Physical Society in Physics Education at the Faculty of Science of the University of Amsterdam and is Director of the Amsterdam Mathematics, Science & Technology Education Laboratory, known widely as the AMSTEL Institute.

Under Dr. Ellermeijer’s direction the AMSTEL Institute was established in 1999. It is an Institute within the Faculty of Science and is dedicated to Mathematics and Science Education. Through a diversity of activities, the Institute focuses on improving Science Education at all levels of education. Today, approximately 40 staff members conduct research and development at the Institute. The influence of this work in science education has been worldwide.

Dr. Ellermeijer has initiated many innovations in physics education. He was a pioneer in the introduction of instruction technology in the teaching and learning of physics. In 1987 he founded the Centre for Microcomputer Applications (CMA) - CMA has been involved in many international projects to support the introduction of Information Technology in Education in both developed and developing countries.

Dr. Ellermeijer has been recognized for his efforts by receiving prestigious awards and positions. In 1999 he received the Prof Minnaert Award for his contributions to Physics Education in The Netherland. Today he is President of GIREP, the international organization for Research in Physics Education

For his pioneering work in developing and disseminating student-centered physics education and for his continuing efforts to promote quality physics learning throughout the world, the International Commission on Physics Education is pleased to present its 2009 Medal to Professor Anton L. (Ton) Ellermeijer.

Two rather non-traditional conferences of physics teachers in the heart of Europe

Leos Dvorak, <leos.dvorak@mff.cuni.cz>
Faculty of Mathematics and Physics,
Charles University in Prague, Czech Republic

The Czech Republic is often called “the heart of Europe” — at least in tourist materials to persuade them to come to see Prague or other parts of this country. However, the purpose of this text is different: to describe two activities of Czech physics teachers which perhaps may be of some inspiration to those in other countries. (One of them, as we shall see, has already become such an inspiration.) These activities are two conferences of physics teachers that deserve, at least in some respect, to be called non-traditional.

Physics Teachers' Inventions Fair

Teachers have a lot of interesting ideas, especially concerning school physics experiments. So, it is useful to put teachers together to enable them to present and share their tricks, “inventions”, variants of experiments and the ways in which they use them. When the founders of the conference *Physics Teachers' Inventions Fair* put this idea into practice, back in 1996, they thought that it would last for just two or three years. Surely the supply of ideas and tricks teachers have on their shelves would be exhausted then. Well, the conference survived longer than expected. It still flourishes and it will celebrate its fifteenth anniversary in 2010. There are always new tricks, new technologies to apply, new variants of experiments and new ways to look at old ones.

What makes this conference a bit special and non-traditional? There are some points worth mentioning:

- It brings together physics teachers from all types of schools: from lower secondary (for pupils of age 12–15) to senior secondary (for students 15–19) to university (especially from departments devoted to teacher training).
- Teachers from all three groups participate actively at the conference, i.e., they present their talks. Sometimes even their pupils and students are involved in the presentations.
- There are no parallel sessions but just one large session so that everyone can see all of the presentations. Thus there is no need to run back and forth between various sessions or to regret that the two talks most interesting to you are at the same time.

Add to this quite a low fee (equivalent to about 20 Euros, really not much for a 3 day conference) and cheap accommodation to make the conference costs not prohibitive, and you have an event that is really useful and attractive. The changing of the host site may also add to its attractiveness: every second or

third year it takes place in Prague, in other years it is held in other towns of the Czech Republic. Roughly 100–170 participants enjoy it each year.

There is another perhaps inspiring point. Printed proceedings are published each year. But you can lose such proceedings, miss some years, or just find it inconvenient to look for an article by some author or on some topic in more than ten volumes of paper proceedings. That's why electronic “super-proceedings” of selected articles of many years of the conference were created – first on CD (comprising the first ten years), then on the web, covering (up to now) the first 12 years of the conference. This resource offers more than 350 articles plus some other supplementary materials. The web version of these “superproceedings” is used quite frequently, being visited by users from more than one hundred unique IP addresses per day. Because of this, it will be developed further and articles from two more years will be added in the near future. Long-range plans include the translation of at least some of the articles to English.

Though the “*Inventions Fair*” is a local conference of Czech physics teachers we also try to invite people from abroad – and not only from countries as close as Poland and, of course, Slovakia. For example, in 2007 Paul Doherty from the San Francisco Exploratorium was the keynote speaker. He also was quite keen on the event. Here are his impressions, written down on his web page after he returned home:

“I was impressed by the great activities the teachers had developed, and I enjoyed the wonderful teaching styles they showed as they taught their colleagues. These teachers didn't talk about teaching physics, they taught us physics with demonstrations, images, and great stories.”

What more appreciation could the organizers and participants want?

From Prague to Long Island

Though Paul Doherty's words cited above have disappeared from the web since then (naturally he compresses the information on his web pages), the influence of the event has lasted. Apart from Paul two or three other people (physics teachers) from the U.S. have visited the conference in recent years. Just a few weeks ago we received notice that they have established a similar conference, “*Teslamania – Physics Teachers' Innovation Fair*” at Suffolk County Community College in Long Island (New York City). Until now it has been only a one day event. It seems

that the first year in 2008 was successful, though, because *Teslamania 2009* is planned for October 24 — see <http://teslamania2009.eventbrite.com/>. (It is nice to see the link to the Czech *Physics Teachers' Inventions Fair* at their web site.)

Of course, we do not pretend that this type of conference is a universal / ideal / everything-solving event. It may, however, be at least a bit inspiring even to some of the readers of this text. If you are interested, why not to come to Prague? (It is a beautiful place, anyway, even not counting the conference. :-)) The next *Physics Teachers' Inventions Fair* will take place in Prague on September 3–5, 2010. The information will appear on the web page <http://kdf.mff.cuni.cz/veletrh/>.

Heureka Workshops

The second conference, or meeting, is even more non-traditional. Let us again use a quotation, this time from a short report by Elizabeth Swinbank from the University of York, U.K., who attended this event in 2004 (see *Phys.Ed.* **40**, No.1, (Jan.2005), p.5):

“What would be your response if you were invited to join a teachers’ conference to be held in the small Bohemian town of Nachod, conducted almost entirely in Czech, where the accommodation would be on mattresses on the floor of a school, with DIY catering from the local supermarket?”

It is really so. The conference, attended each year by about 50–80 physics teachers and students who are future physics teachers, takes place in a high school (“gymnasium”) in Nachod, which is a small town in northeast Bohemia, some 150 km from Prague. There is nothing luxurious at the Heureka meeting. We sleep in our sleeping bags in classrooms and everyone takes care of their own food. What attracts people to come under such circumstances and spend the whole weekend from Friday evening till Sunday afternoon? Again, the conference has its special points. For example:

- There are no theoretical talks; everything is practical. It is not, in fact, a classical conference. It has the form of a set of workshops, about 15-18 each year, each lasting 1.5 hours and repeating several times (two to four times). Each participant can attend up to eight workshops.
- It mixes people of all ages – from students in the first year of bachelor studies who will (after their master studies) become physics teachers, to experienced teachers who have taught for tens of years. In addition, some people attend from the Department of Physics Education of the Faculty of Mathematics and Physics, Charles University in Prague, which organizes the event.
- It enables all participants to be as active as they like – and they really are!
- The informal accommodation puts people together and enables them to discuss problems or to do experiments till late at night. In fact, at this year’s conference *Heureka Workshops 2009* (which took

place October 2–4) the participants persuaded the leaders to organize an “extra run” of three workshops on Saturday evening, after the end of the official program. Some participants were seen to be trying experiments until nearly midnight.

The entire event is rather informal. There is no fee and no payment for accommodation. Thanks to the local organizer (experienced and devoted teacher Zdenek Polak who is also an inexhaustible source of fresh ideas) we have ideal conditions at the school.

The mixing of people and also of foreign guests can be illustrated at this year’s conference. Of 18 workshops one was led by an associate professor from Kharkiv, Ukraine, one by a Ph.D. student from Ljubljana, Slovenia and one by two physics teachers from the Netherlands. (Check out the web page http://kdf.mff.cuni.cz/heureka/en/uploads/nachod_en.pdf to see the details.) Of the remaining workshops, 4 were led by people from universities, 2 by students, 6 by teachers from schools and one by a man coming from an industrial research background. A beautiful mixture, is it not?

We will not describe here the whole Heureka (“Eureka”, in English) project from which the *Heureka Workshops* originated and to which they belong. Irena Dvorakova, who is the founder and leader of the project, has described it already in some talks and posters at various GIREP conferences, and perhaps there will be a chance to mention it at some other occasion.

What should be noted is the fact that it is a long-lasting project. Started in 2003, the *Heureka Workshops* conference reached its seventh year this October and altogether it has included some 108 workshops. Most of them are described in the conference proceedings. (These appear with some non-trivial time lag due to the fact that the editor — the author of this text — cannot always cope with time.) Alas, they are in Czech, but again we plan to translate at least some of the articles to English in the future.

From Nachod — to where? (and back.)

This subtitle is a joke, of course. The *Heureka Workshops* have not inspired any similar event yet – and we do not claim that they must or should. But perhaps some of their features may be inspiring or appealing to you. If this is the case, use them, and/or come to visit us. *Heureka Workshops 2010* will take place (probably, the dates are not absolutely finalized, consult the web page

<http://kdf.mff.cuni.cz/heureka/en/>)

on October 1–3, 2010. We will be glad to invite you.

And if you organize some similar event with physics teachers, be so kind and let us know. We are also always looking for further inspiration.



First announcement

GIREP-ICPE-MPTL 2010 Reims International Conference August 22-27, 2010 – Reims, France

Teaching and Learning Physics Today: Challenges? Benefits?

We kindly invite you to participate in the GIREP-ICPE-MPTL International Conference on *Teaching and Learning Physics Today: what challenges? what potential benefits?*, to be held August 22-27, 2010 at the Centre des Congrès, Reims.

During the last 15 years, in most countries, the popularity of physics among students is low and enrolments have declined. Different approaches have been proposed to confront this situation, both at school and university level. It seems that some of them have already been successful. We hope that our conference will offer an opportunity for in-depth discussions of the topic and for the sharing of experiences in order to move forward in this field.

The organisers invite contributions addressing the following sub themes in the field of:

1. Physics Education Research and Suggestions for Improving Physics Teaching
 - Teacher training (developing teaching competences, etc.)
 - Initial teaching
 - Different ways of learning

ICPE Chair's Corner *(continued from page 1)*

Building on its experience and expertise, obviously, a 5-year effort of this nature cannot be undertaken within the existing financial structure of only IUPAP or ICTP. Then the organizations will together solicit funds from both public and private sources with the goal of eventually getting governments and regional professional organizations to take major financial responsibility for the workshops in their own territories.

Project *Physware* will provide us a unique opportunity to create and strengthen regional and international network of physics educators who can

- Use of multimedia
 - Teaching using the History of Physics
2. Physics
 - Physics today (spintronics, ...)
 - Energy,
 - System Earth (climate, environment, ...)
 - Physics and Human Body,
 - Teaching University Physics to non physicists,

Oral presentations, workshops and symposia will take place during morning and afternoon parallel sessions. Multimedia workshops and poster presentations are also encouraged.

The website of the conference will be available soon. A call for papers will be issued promptly.

NOTE: We are happy to reveal that 2007 Physics Nobel Prize winner Albert Fert is one of our invited keynote speakers.

think globally and act locally. It is for us now to make it our commission's flagship program.

ICTP will host a *PHYSWARE* website. This repository of high quality physics education resources will serve the needs of those from countries where examples of best practice are not easily available. The website will consolidate the gains of *Physware* workshops, give sustained support to *Physware* participants and create a forum for continued sharing of efforts. It will strive to create a community of practice.

Pratibha Jolly

Pratibha Jolly
ICPE Chair

Recent Developments in Physics Education in Canada

Tetyana Antimirova¹ <antimiro@ryerson.ca>, Pedro Goldman¹, Nathaniel Lasry², Marina Milner-Bolotin¹
and Robert Thompson³

¹ Department of Physics, Ryerson University, Toronto, Canada

² Abbot College and Centre for the Study of Learning and Performance, Montreal, Quebec, Canada

³ Department of Physics and Astronomy, University of Calgary, Alberta, Canada

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It is a follow-on piece to the article which appeared in this Newsletter, No.55, April 2008

Physics Education, a relatively new research field in Canada, has witnessed significant growth over the past decade. There are at least two reasons why the impact of these developments should be carefully examined. Firstly, the majority of the post-secondary students taking physics are not physics majors: consequently, the quality of physics teaching affects the educational experiences of thousands of students. Secondly, the quality of physics teaching at all levels affects the scientific literacy of the general population, which is one of the indicators of a country's economic potential. The goal of the current paper is to inform the readership of the recent developments in Physics Education Research (PER) in Canada.

Historically, teacher preparation has been confined to the schools of education, often divorced from the science departments. To this day, most of the science education research comes from the schools of education worldwide. PER, as a field, emerged roughly 40 years ago as a product of the “post-Sputnik” era. The PER movement was spearheaded by the physicists Robert Karplus and Arnold Arons. The main difference between the physics and science education research fields is their areas of interest and employed methodology. PER researchers, with their physics expertise and the knowledge of educational psychology, focus on the learning and teaching of physics-specific concepts from elementary schools to universities. This also includes physics teacher preparation and in-service teacher professional development. Physics education researchers view physics learning and instruction more as a science than an art. The importance of using science tools for teaching science and evaluating the instructional outcomes was stressed in Carl Wieman's Herzberg Memorial Public Lecture at the Canadian Association of Physicists (CAP) congress in 2007 entitled “Science Education in the 21st Century: Using the Tools of Science to Teach Science”.

Currently, PER is represented by well over a hundred groups worldwide, with a few dozen active PER groups in the United States alone. In Canada, there is only one PER group housed at the Department of Physics: the Physics Education Research Group at Ryerson University. Affiliated with the Faculties of Science, there are two other science education groups:

the Carl Wieman Science Education Initiative at the University of British Columbia and the newly formed Research and Instruction in Science Education (RAISE) Centre at the University of Calgary, which involves faculty from all six science departments.

Awareness and interest in PER is growing among the Canadian physicists. Yet, one may ask why PER is so under-represented in Canada. One of the main reasons is that PER is severely undermined by the continued lack of sustainable government funding that limits the opportunities for graduate studies in Physics Education. Canadian granting agencies do not currently recognize subject-based science education research, such as PER, as a scientific discipline. Despite the funding-related challenges faced by the Canadian PER faculty, excellent PER work has been done in Canada for many years by pioneers such as Ernie McFarland at the University of Guelph, Robert Hawkes at Mt. Allison University, Calvin Kalman at Concordia University and Alan Slavin at Trent University, to name just a few. They researched and promoted innovative teaching methodologies and employed scientific methods to analyze their impact on student learning. Even though this work had been done with little institutional or financial support, it planted the seeds of PER in Canada. Consequently, faculty who currently devote at least part of their time to PER can be found across Canadian universities, high schools and colleges.

A description of a few case studies of PER, as well as some recent developments on the Canadian PER scene, can be found in references. Two major recent university initiatives, fully funded by their respective institutions, deserve a note. As previously mentioned, the Carl Wieman Science Education Initiative is the result of a 12 million dollar grant offered by the University of British Columbia to the Physics Nobel Prize Laureate, Professor Carl Wieman. This initiative opened a new era in the Canadian subject-based Science Education Research showing the interest and commitment of a major Canadian research university in improving the quality of science teaching. In Ontario, inspired by the science education research findings, the University of Toronto is investing 4.7 million dollars to build a new state-of-

the-art introductory workshop/studio style physics laboratory.

Ryerson University in Toronto has taken a major step towards formally recognizing and promoting PER. Indeed, in the past four years two full-time tenure-track physics faculty members (Tetyana Antimirova and Marina Milner-Bolotin) were hired by the Department of Physics specifically to conduct PER. To our knowledge, these are the first tenure-track faculty PER positions in Canada. Two more faculty members devote part of their research to PER. One of the major research themes of the group at Ryerson is investigating how enquiry-based learning in large introductory physics classes is enhanced by the use of modern technology (clickers, real-time data acquisition and analysis technologies, interactive computer simulations, Video-based Motion Analysis, on-line tutoring/homework/testing systems, etc.). Thanks to the recent Hewlett Packard Technology for Teaching Grant, the Ryerson PER group is creating a Mobile Science Lab for Science and Engineering Students. Another focus of our research is studying, in the introductory physics courses, the impact of the high school physics experience on the students' attitudes towards science, their motivation and learning outcomes.

At the University of Calgary, Robert Thompson leads a group focused on research and development of the small group instructional components (i.e. teaching laboratories and tutorials) of large first year physics service courses. It is specifically focused on using teaching technologies (e.g. computer-based experimental data collection devices and computer simulations) to create an integrated, concept-based, learning environment for student learning in mechanics, electromagnetism, and thermodynamics. This project, which has a significant research and development component, has been fully funded for a three year period through 2010 by University of Calgary sources at a level of approximately \$75,000 per annum, and includes the hiring of, to the best of the authors' knowledge, Canada's first Post-Doctoral Fellow/Research Associate fully dedicated to PER, Dr. Daria Ahrensmeier. The Faculty of Science in Calgary is also the home to the newly formed RAISE (Research and Instruction in Science Education), a multidisciplinary group of scholars committed to quality university education in the Sciences. RAISE's first major research project, also funded through University of Calgary sources, is focused on the completion of a comprehensive survey of activities, innovations, requirements, aspirations, and barriers related to the science education efforts of every faculty member in the Faculty of Science at the University of Calgary. Completion of this ambitious project is slated for mid 2009.

All these initiatives have been funded mainly at the university level, and have not yet had a significant

effect on the funding of PER initiatives at other Canadian universities. However, we believe that they are indicative of significant changes to come.

The efforts of the individual faculty members pursuing PER field are not to be overlooked. Calvin Kalman's educational research at Concordia University involves full-blown testing of a student-centered approach based on journal writing and in-class use of small collaborative group methods. His work emphasizes cognitive aspects and critical thinking development. His long-term work has recently culminated in publication of two PER-focused books offering best practices and promoting effective teaching in Science and Engineering.

Alan Slavin's (Trent University, Peterborough, Ontario) work on monitoring drop-out and failure rates in the introductory physics courses emphasizes the importance of high school physics courses among other factors determining students' success.

Nathaniel Lasry (John Abbott College, Montreal, Quebec) collaborates with Eric Mazur's group at Harvard in studying Peer Instruction across different institutions, student populations and types of classroom social interactions. Disturbed by his students' perception of a disconnect between classroom physics and the physics of everyday life, Lasry is also very interested in learning from context-rich everyday life-like activities. With the support of the CCDMD (a non-profit Quebec Ministry of Education publishing house) Lasry has recently launched a Problem Based Learning web site for college physics. This website proposes a growing number of life-like activities, student and teacher materials, and actively solicits meaningful context-rich activities from physics faculty members across the country. The site can also be accessed through the comPADRE portal of resources for Physics and Astronomy by searching for PBL or through the recently launched Physics Source portal for introductory physics resources.

In our view, the contributions of the Canadian physics educators to PER field are limited not by the lack of expertise or interest, but only by the lack of funding. The urgency of creating sources of continuing governmental funding for PER was emphasized in a recent letter to the presidents of the three major Canadian granting agencies (NSERC, SSHRC and CIHR). CAP suggested that science education grant proposals be evaluated by representatives of all three agencies.

Meetings at the 2008 CAP Congress suggested that long term progress in the area of science education research is possible, but definite actions by the professional societies and funding agencies towards implementing some of the ideas outlined in this letter would, in our opinion, be a major step forward from

the current situation that has serious negative ramifications for the state of physics education in Canada. The request for changes in PER funding in Canada was endorsed by more than 120 Canadian scientists and physics educators, as well as the President of the American Association of Physics Teachers. Moreover, the members of the Ontario Association of Physics Teachers who attended the general OAPT meeting held during 2008 Annual OAPT conference has unanimously voted in support of this initiative.



Fig.1 A very successful DPE session at the 2008 CAP Congress in Quebec City.

Year	2005	2006	2007	2008
Plenary speakers ¹			Carl Wieman	Eric Mazur
DPE sessions ²	2	2	2	3
Invited speakers ³	6	4	4	6
Contributed talks	8	8	8	8
Posters	4	2	4	1

¹Not including CAP Medal for Excellence in Teaching plenary talks.
²Not including CAP/DPE teachers workshop sessions
³Not including invited speakers at the teachers' workshop.

Table 1: Division of Physics Education Activity at CAP Congress 2005/2008

A final indicator of increased interest and activity in Physics Education in Canada is the volume of activity and the profile of the education-related activities at the annual CAP Congress in recent years. In addition to the plenary prize talk given each year by the recipient of the CAP Medal for Excellence in Teaching, the last two Congresses have each featured, as selected by the CAP program committee, plenary talks in physics education (in 2007 by Carl Wieman and in 2008 by Eric Mazur). Furthermore, in addition to the teachers' workshops that happen each year, the Division of Physics Education has organized 2 or 3 oral presentation sessions in each Congress. These sessions include both invited and contributed talks related to education research and curriculum development, with the numbers summarized in Table 1, above. We can further attest to the recent surge of interest in Physics Education Research among physics faculty in Canada as testified by the extraordinary attendance at all the Division of Physics Education (DPE) sessions of the 2008 CAP Congress (see Fig. 1), culminating with a standing-room only session, which concluded with an invited talk by Eric Mazur that spontaneously developed into an impromptu question and answer session that continued well into the lunch break and beyond!

We believe that recent developments in Canada and abroad give us an unprecedented, historic opportunity to bring Physics Education Research in Canada to the status, recognition and impact on physics teaching practices that it has in most countries. Although there are still few PER faculty members in Canada, our contributions are beginning to be recognized abroad. For instance, next year's annual PER Conference which will be held in Ann Arbor, Michigan, will be organized by an all-Canadian committee which is composed of three authors of this manuscript. We should seize this opportunity: we must act now, with vigour, energy and enthusiasm to convince the granting authorities of the need to fund this important field, and the regulating bodies to allow us to introduce Physics Education as a viable discipline for Graduate Programs. We would like to emphasize the importance that a strong Division of Physics Education of the CAP, the main body representing Physics Education in Canada, will and should have in these pursuits.

Finally, "Physics in Canada" has recently launched "Physics Education Corner" to inform the membership of the ongoing developments in Physics Education in Canada. We hope that this venue will be used by our members to report on any new findings that have a potential to improve physics teaching practices across Canada.

*Note: The reference list for this article may be found at: [La Physique au Canada, Volume 65, No. 1, pp.21-22](#)
 URL:<http://www.cap.ca/pic/archives/65.1%282009%29/source.html>*

Citation for the Presentation of the ICPE Medal

to

United Nations Educational, Scientific and
Cultural Organization (UNESCO)

Bangkok, Thailand

October 2009



The ICPE medal is usually awarded to individuals for “outstanding contributions to physics teaching of a kind that transcends national boundaries”. On rare occasions, however, it is awarded to an organization. The last time this occurred was in 1991, when it went to the International Physics Olympiad. At the ICPE2009 conference in Bangkok, the 2008 medal was awarded to UNESCO itself. It was presented by the vice-chair of ICPE, Professor Robert Lambourne Jolly, who delivered the following citation.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) is awarded the ICPE Medal for the year 2008 in recognition of its efforts to promote physics education, especially active learning, in the developing world. For many years UNESCO has supported participation of physicists from the developing countries in a variety of physics education-related conferences. It has also supported educational activities through the International Centre for Theoretical Physics in Trieste. It was a major sponsor of the World Conference on Physics and Sustainable Development at Durban in 2005. It subsequently supported the implementation of the Action Plans that emerged from that Conference, which began ongoing collaborations among many physics educators. Most recently, it provided funds to develop and deliver the workshops on Active Learning in Optics and Photonics. Thus, the organization has provided a variety of efforts to promote physics education.

This award is a befitting tribute to UNESCO's long-term association with ICPE. The International Commission on Physics Education was established as Commission 14 of the International Union for Pure and Applied Physics soon after the first ever IUPAP sponsored International Conference on Physics Education was held at the UNESCO House in Paris towards the end of July 1960. The Paris conference formulated a number of resolutions that formed the basis of the current mandate of our commission. Since inception, our Commission's ties with UNESCO have been very strong.

For almost 50 years UNESCO has supported the development and dissemination of physics education throughout the world. For this continuing effort to improve physics teaching and learning, the International Commission on Physics Education is pleased to present UNESCO with its 2008 Medal.

IUPAP – ICPE

International Commission on Physics Education
International Union of Pure & Applied Physics*Editor:*

A/Prof Ian D. Johnston
School of Physics
The University of Sydney
Sydney, NSW 2006, Australia

tel: +61 2 9351 5982

fax : +61 2 9351 7726

email: i.johnston@physics.usyd.edu.au

Publisher:

UniServe Science,
Carslaw Building (F07),
The University of Sydney
Sydney, NSW 2006, Australia

tel: +61 2 9351 2960

fax : +61 2 9351 2175

email: uniserve@usyd.edu.au

web: <http://science.uniserve.edu.au/>

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