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Report on Physics Education in Japan

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In the afternoon of March 11, 2011, Japan was struck by gigantic earthquake, followed by an extremely large scale tsunami. The tsunami disrupted the Fukushima I and II nuclear power plants, leading to severe problems including two large explosions and leakage of radiation. To those friends and colleagues in the international community who have indicated deep concern and encouragement, the Japanese physics education community expresses sincere gratitude.

Historically, international exchanges have stimulated Japanese efforts towards physics education innovations. The Association of Physics Education of Japan (APEJ) established in 1975 by Tae Ryu (formerly Sophia Univ.) has been actively promoting international exchanges.

The International Conference on Physics Education (ICPE) 2006 held in Tokyo intensified the awareness of Japanese physics educators of the rapid developments in the student-centered active-learning methods based on Physics Education Research (PER). The conference inspired, on one hand, the further development of Japanese original active-engagement teaching methods, and on the other, the interest in PER and PER-based teaching.

In the Japanese science-teacher community at pre-college levels, there has been a tradition of collaboration for teaching innovations through voluntary grass-roots organizations among teachers at national and local levels. Some Japanese original active-learning methods have been developed and practiced through such activities. An example is the Hypothesis–Experiment–Instruction method [1] proposed by K. Itakura and his collaborators in 1960s, which has been attracting international attention.

Another example is the so-called Tamada method, or "Active-Learning with In-Class Assignment" method, which was originally proposed also in 1960s by the late Y. Tamada, an elementary school teacher. It aims at student achievement of conceptual understanding through engaging students to think in depth and to express their thoughts in writing prior to holding whole class discussions. Remarkable implementations of this method in high school classes were reported by T. Ishii (Kitamoto HS) at ICPE2006. [2]

Increasing numbers of Japanese teacher groups are studying PER-based teaching. An example is the "Physics Suite" Study Group formed in APEJ. The group members include H. Yuguchi (Ohmiya HS), H. Nitta (Tokyo Gakugei Univ.), and the author of this article. The group consists mostly of teachers from high schools and universities in Tokyo and the surrounding area. Various elements of the Physics Suite [3] are being tested by S. Kishizawa (Koshigaya-Kita HS, now Takusyoku Univ.), S. Ukon (Shonan HS) and many others. *Continued o/p*

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Another example is the "Advancing Physics" Study Group, consisting of over 20 teachers from high schools and universities in Kyoto and its vicinity. The members include T. Murata (formerly Kyoto Univ. of Education), J. Ryu (Kagawa Univ.), T. Yamazaki (Doshisya Middle and High School), and K. Taniguchi (Kyoto Univ. of Education). The group started with an extensive study of "Advancing Physics", the pre-college physics curriculum in UK. [4] After the ICPE2006, this group has been collaborating closely with the Physics Suite Study Group on PER based learning methods. Starting last year, teachers in several high schools are carrying out trial implementations of Interactive Lecture Demonstrations in their physics classes.

Stimulated by experienced physics educators like H. Kawakatsu (Meijo Univ.), more groups are being formed attracting researchers in younger generations into PER.

Bridging through Science Outreach

In June 2010 the Council for Science and Technology Policy issued guidelines to researchers in government funded research programs encouraging their outreach to citizens on the research outcomes. The Quantum Information Processing Project [5] led by Y. Yamamoto, a professor at the National Institute of Informatics (NII) and Stanford University, is one of such projects. The outreach activities include the visiting lectures in primary and secondary schools by the project members. In his visiting lecture in a high school, Yamamoto gave an eye-opening introduction to quantum mechanics choosing "teleportation" as the topic, introducing the key concepts in quantum physics such as "non-locality" and "entanglement."

Fig.1 Shooting colored balloons with a green laser to check the wavelength dependence of absorption.

S. Utsunomiya (NII) leads these outreach activities. She herself has given visiting lectures at an elementary school. The science classes (Fig.1) were planned and implemented in collaboration with an experienced school teacher. Mutual exchange and cooperation between cutting-edge researchers and school teachers have been found to make the outreach activities very effective. They also have plans for training sessions for school teachers to expose them to the topics in the on-going cutting edge research.

The Disaster

On March 11, shortly before 3pm, the author writing this manuscript in his home in Tokyo was suddenly disrupted by severe shakes. It took some time before information came in about this 2011 Tohoku Earthquake and Tsunami.

The magnitude of the earthquake was estimated to be 9.0, which makes it the most powerful known earthquake to have hit Japan, and one of the five most powerful earthquakes in the world overall since modern record-keeping began in 1900.

Although Japan's earthquake-resistant buildings seemed to hold up well, it was the tsunami that did most of the damage. The area flooded was about 500 square kilometers, along the northeastern coastline of the Japanese mainland. The powerful tsunami water destroyed most of the buildings in the area.

As of April 7, the confirmed deaths exceed 12,600, with over 15,000 people missing. The damages to the schools are also very extensive, affecting approximately 7000 facilities according to the Education Ministry statistics.

The earthquake triggered the shutdown of reactors of the Fukushima I and Fukushima II Nuclear Power Plants. The subsequent tsunami stopped Fukushima I station's backup diesel generators, which in turn led to two explosions and partial meltdowns at the Fukushima I facility. Fears of radiation leaks led to a 20 kilometers radius evacuation around the plant. An estimated 200,000 people have been evacuated from Fukushima's 20 km zone.

The Unprecedented Challenges

The destruction by the quake and tsunami is tremendous in scale. It occurred despite the fact that Japan has the world's densest seismometer network, the biggest tsunami barriers, and the most extensive earthquake early-warning system. The magnitude of the earthquake was much greater than those systems were prepared for.

The Japanese are determined to attain reconstruction and rebirth as they did from the devastation at the end of World War II in 1945. The journey will be long and strenuous. But we believe that it is the opportunity to construct a better, safer, and a healthier society.

One thing for certain is that the cultivation of science literacy is essential for the reconstruction. We need to rethink deeply what science for all and physics for all mean. It is clear that science and physics education for all the citizens must carry an even more important role than ever to share the knowledge and the skill for a safe and healthy social environment, and to have all citizens to participate in making intelligent decisions on policies for today and for future generations.

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Physics Education in Argentina

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It is not a simple thing to write an article about the state of physics education in your own country for colleagues in other places. Discussing human activities which are strongly linked to the developmental status of a nation requires a review that should be sufficiently rigorous so as to be of an informative nature but at the same time maintain the social and historical context so that the reader can understand the significance of that information. For this it is necessary to find a flexible course that connects a story that is anecdotal and contextual with sterile facts. For this I have found it useful to take as a guiding thread, the analysis and perspectives presented in the conclusions from the International Conference of Physics Teachers and Educators, Guilin, People's Republic of China, August 19-23, 1999.

> *The very rapid changes of knowledge and techniques in science and technology, and the changes they have caused and will continue to cause in our societies, define the challenge and the mission for us as teachers in the next millennium. It is the challenge of life-long learning and understanding for all.*
>
> *This challenge has many parts. For us as teachers, and as teachers of teachers, it is the challenge of personal professional development. The profession of teaching needs, now more than ever, to become one of life-long development. We need to keep up-to-date in developments in physics and related sciences, in developments in physics education research, in developments in curriculum reform and instructional methods and technologies, and in the theories and techniques of examination, evaluation, and assessment – including self-assessment.*

Based on this, in this paper I will try to share my personal perspective of the situation in Argentina with my fellow colleagues. Trying not to lose perspective, this review will focus on the four areas highlighted in the recommendations of the 1999 ICPE report.

- Advances in physics and related sciences as related to the institutions that produce physicists and those that do research in physics.
- The evolution of physics education research, analyzed from the perspective of the institutions that train teachers of physics and groups that conduct research in physics education.
- Curricular reform and updated teaching methods and technologies, as evidenced from the documents, proposals and directives of official institutions.
- Theories and analytical techniques, methods for testing and evaluation, including self-evaluation; analyses which are less reliable because they not require a study of what actually happens in classrooms.

Argentina has a long history in physics that began at the University of La Plata in 1909 with the arrival of Emil Bose. This university was the largest physics research center in Argentina until the 1950's. After this time the universities of Buenos Aires and Córdoba created physics departments. At the same time research centers were established at the National Commission of Atomic Energy in Bariloche and in Buenos Aires. Now there are physics departments in various universities across the country.

. In late 2010, there are 27 universities where one can study physics-related careers, including 26 state and one private institution. In the single private university only the Bachelor in Physics Education is offered. Of the 26 state universities, 12 of them offer the degree of Professor of Physics and also a BS in Physics. In several cases these programs are articulated with each other so that both degrees can be obtained simultaneously.

Of the 14 remaining, three provide only degrees in physics, in eight only the physics teaching career program is offered and the remaining three offer a degree in Physics Education. It should be pointed out that the programs offering interdisciplinary training or a degree in physics education do not train professional physicists nor professors of physics. Two such licensing programs for teachers are embedded in undergraduate schools of engineering.

In Argentina, universities are not the only place where teachers of physics are trained. There is also a system called the non-university higher level (Nivel Superior No Universitario) that educates physics teachers destined for secondary schools and constitutes the same institutions that certify teachers. For most of their existence, these institutions have been entirely separate from the universities, in many cases even when they share the same teachers. The National Teacher Training Institute was created in 2007 under the Ministry of Education to bring together all the institutions of non-university teacher education in the country and has a strong mandate to build bridges with those at the university level. At the end of 2010 there were 35 training institutions in physics education, 17 of which are in the Province of Buenos Aires. The National Teacher Training Institute since its inception has offered a clear and sustained drive to improve the quality of teacher training.

Argentina is a relatively small country in terms of population but has had ongoing financial problems. In mid 2002 a report by external auditors showed that the consequences of the economic crisis for the physics community have been profound. For example, economic instability does not allow research institutions to recruit members internationally, as do most prosperous countries. Even many of the graduates who continue their postgraduate studies at foreign universities have proven to be expensive for Argentina to bring home. Partly because of this, Argentina has produced many excellent physicists who are now dispersed throughout the world, a result that is unique in South America. These physicists have made significant contributions to particle physics, condensed matter physics (particularly superconductivity), nuclear structure and other fields. In recent years both the number of fellowships and grants for research projects granted by the Council for Scientific and Technological Research (CONICET), the National Agency for Promotion of Science and Technology (ANPCyT), provincial agencies and the secretariats Science and Technology of National Universities have increased.

The development of physics education, both in its degree of development and in education research has not been free of the same problems found in the rest of the world. Physics departments have been and are still quite reluctant to accept research in physics education as part of their activities. There may, however, be exceptional research groups or graduate programs in physics education that are embedded in institutions which either train BS physics or institutions where research is done in physics.

In this country there are two entities that bring together physics teachers. On the one hand, Argentina Physics Association (AFA), which brings together physicists working at universities which train physics. On the other hand, there is the Association of Physics Teachers in Argentina (APFA), whose members are mainly teachers of physics in teacher training institutions or programs in engineering. As it can see the associations of professionals also reflect the divide between physics teacher education and training of researchers in physics.

In relation to curriculum reform, updated teaching methods and technologies the different types of training, described previously, should be taken into account. First, in Argentina, national universities are autonomous. University autonomy in Latin America is deeply rooted in the student movement launched in Cordoba, Argentina, at the end of the second decade of the twentieth century. The range of dissatisfaction in Cordoba and the proposals for change that accompanied it resulted in perhaps a university autonomy eminently Latin America. The subsequent autonomy and academic freedom were translated into the academy with the effect that each university proposes and approves curricula for their different career paths. The result is different universities provide the same career titles for curriculum that are sometimes quite different. This is the situation in the 26 universities that grant degrees related to physics, be they bachelor degree or teacher training certificate.

In the arena of the institutions of non-university higher education, the creation of the National Teacher Training Institute (INFD) in 2007 marked the beginning of a process of revitalization, development and prioritization of teacher education in Argentina. Respecting regional nuances, a universal teacher-training program was legislated at the national level. At the same time, there were unmistakable signs of establishing relationships with universities that train teachers. To this end in 2009 a joint committee was formed which proposed a draft report titled “Improving Undergraduate Training of Physics Teachers”. The commission was composed of teachers both at the university and non-university levels. They produced a document that suggests what important knowledge components should be taught to students who will be teachers of physics at the introductory level (teachers of students aged 12 to 17 years). A substantial change was proposed to move from the question ‘What physics do I want to teach?’ to the question ‘What do I want my students to understand about physics?’ The report advocated that learning based on understanding be encouraged by providing different levels of understanding, using active teaching methods that promote performance in relation to stated goals, and using evaluations and tests that assess these objectives. Regarding content, the incorporation of topics in physics of the twentieth and twenty-first century, a commitment to deepen the topics of social significance and the effective incorporation of digital information technologies and communication were advocated.

In a similar way, in 2009, the University Council for Natural Sciences agreed that the training of teachers in these areas should be considered among those "whose exercise would jeopardize the public interest, putting at direct risk health, security, rights, property or the development of the inhabitants." Thus the curriculum must take into account the basic curricula and practical training criteria established by the Ministry of Culture and Education. Additionally the National University Assessment and Accreditation Commission must accredit the career path periodically. In practice this has meant that from 2010 to the present, the universities that train teachers of physics hold meetings to agree on standards to be met by all university courses in physics teacher training. Failure to comply with such conditions upon approval has budgetary consequences for the universities. There are also advanced agreements relating to three areas of knowledge that integrate teacher education in physics: A field of general education, a field training including physics and its teaching and practical training. The relative weights of each field have also been agreed on.

Although these changes are not such as to directly affect the formation of students studying for a Bachelor in Physics, they can hardly escape the discussion, most notably in general physics courses which may be common to both physics majors and future teachers. Discussion of these issues at universities where physics training has a strong intersection with the training of physics teachers has already begun.

Finally, regarding theories and analytical techniques and methods for testing and evaluation, including self-evaluation, a wide range of views exist depending on the university. In general, it could not be said that teaching strategies for active learning, teaching for understanding, digital information technologies and communication or new methods for examining or assessing have had a large impact within universities where physics is taught. In many places a traditional education based heavily on disciplinary logic continues. While it is true that the teaching of physics in high school has not changed much yet, there is also not much traction for change at the university level. Researchers trained in physics and who are often the trainers of human resources in physics, in general do not consider the need to acquire training in teaching, new strategies for teaching or counseling to better assess student understanding. They continue to rely on an underlying philosophy that the only requirement needed to teach physics is to know physics. This is also consistent with a reluctance to accept the results of physics education research within the institutions of physics.

This situation has begun to change in younger universities and in junior researchers. In some universities physicists are becoming interested in learning about issues related to learning and teaching physics. Whether it is the decline of students interested in physics or high dropout rates in the early years some communities of physicists have begun to wonder if these problems have something to do with the way physics is taught and evaluated. Questions, concerns and apprehension are being raised in some universities. As a demonstration of these changes the Physical Society of Argentina has since 2005 had a Division in Physics Education that provides support for various teaching issues. The author of this article is honored to have received a position in Commission 14 of the IUPAP in part as a result the recognition of needed changes in the teaching of physics.

Author's note: More than a description of the situation, this article is a personal perspective from someone in the physics community at a national university. It is therefore understandably partial, incomplete and possibly biased by professional membership and performance.

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Secretaría de Políticas Universitarias www.me.gov.ar/spu/

Fobinet: An Internet Supported Platform for Nationwide Coordination, Promotion and Funding of Physics Teacher Training Activities in Germany

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Abstract

Fobinet is a German acronym, meaning "network for in-service physics teacher training". Funded by the German Wilhelm and Else Heraeus foundation [1] and run by the authors under supervision of the German Physical Society DPG [2], Fobinet is a nationwide project in Germany, which was very successfully operating for a period of three years from April 2008 to March 2011.

Its main purpose was to centrally coordinate, strengthen, promote, and initiate in service physics teacher training all over Germany. This was supported by establishing an internet platform [3]. Its data base served as basis for not only initiating new activities but also as platform for announcing nationwide as well as regional teacher training activities in physics. In addition it was intended to help experts in the field – teachers as well as scientists - to start networks, i.e, to come to know each other and start common new activities. Fobinet was very successful and in some respects, expectations were even surpassed: it reached more than 20,000 teachers within the three years running phase!

The project

Physics teacher training can offer support in two different areas: understanding modern ideas of teaching and learning and understanding modern developments in physics. In the first area usually researchers in science education are asked. In the second, physicists are the experts. According to the small number of people working in physics education departments in Germany and according to time consuming reform activities in the universities the capacities for teacher training are getting smaller from year to year.

In order to provide useful information and ideas about contemporary physics and physics education, in service training for physics teachers must at least partially be conducted by experts in the field, i.e. researchers working in physics research and development projects, and physics educators doing research and development. This means that successful activities require involvement of experts from industry or universities. In Germany, this need was seen already more than 30 years ago by the German Physical Society; and in 1983, it established a series of in service teacher training seminars – usually for the duration of one week – at its center in Bad Honnef [4]. At present, there are regularly three full week courses for physics teachers as well as two rather shorter courses (3-4 days) for beginners or new teachers each year, founded by the German Physical Society and partially by the Wilhelm and Else Heraeus foundation [5].

In the 1990-ies and the first decade of this century, the situation of in service teacher training in physics in Germany became critical. Reforms of regulations led to a general increase of the need of teacher training activities. But due to lack of money the regional training centers, focused now more on pedagogy or general didactical skills and very rarely training in modern topics of physics were offered. Second, there was and still exists quite a shortage of physics teacher students. Therefore also students of either other natural sciences or physics without any pedagogical education were allowed to become physics teachers in some of the states of Germany. Those career changing teachers often lack pedagogical, didactical, and methodological skills, but sometimes they also do not have enough physics connected content knowledge as well.

These two facts combined easily explain the enormous demand of teacher training activities. In particular regionally organized short courses focusing on the physics are needed which can help teachers to develop interesting teaching strategies for modern physics teaching as well as courses focusing more on characteristic problems of career changers. This was the starting point for the project Fobinet in the year 2008.

The idea was to

- collect and analyze all available data for offered physics teacher training courses all over Germany in order to get to know in detail the state of the art and offer information
- extract relevant and needed content for such courses
- find experts who would be willing to contribute to regional and nationwide teacher training courses
- plan, program and establish an easy to access data base within an internet platform
- collect data referring to the organization and jurisdiction matters of such courses within the various states of Germany
- find cooperation partners from other institutions/organizations offering similar teacher training activities
- permanently coordinate and help planning and organization of teacher training courses
- help in planning to establish regional teacher training courses
- offer marketing/public relations to make project ideas and results widely known within the community
- reach the concrete aim: at least 20 000 teachers participating in one or more courses/seminars within the three years

These plans were quite ambitious and it is obvious that the main ingredient for successful realization is funding. Our experiences with this project concerning funding are simple and obvious and can be summarized as follows:

- Attendance increases if there are no large costs associated with attendance /participation. Usually – if at all – there should only be travel costs what automatically means that regional courses are needed if many otherwise reluctant potential course candidates should be successfully reached.
- Course leaders/speakers should also get funding to cover their travel costs. In addition, it was found helpful if small honorariums were given to the speakers. This definitely helps if the speaker is very good and therefore asked more often to offer this service for such events.
- Those organizing a course/seminar – which can e.g. be teachers themselves who feel the need for in service training – must get support also in partial funding. Quite often teacher training is voluntary and must be done in addition to the regular work. Therefore, any obstacle such as finding a room, writing invitations, organizing the speakers, and also handling travel cost refunds for speakers are potential reasons for not organizing such an event. People are hesitating if additional workload appears to happen. Here, financial help for hiring e.g. a student to handle all bureaucracy is helpful. Alternatively, and this was done quite often during the project, professional help was offered with regard to organizing the event.

This means that funding must not only include support for speakers and attendees but for organizational help as well. This last topic is often neglected. To summarize: successful teacher training seminar projects need funding for all three areas, attendees, speakers, and organizers.

Results:

Within the three years running time of the project all planned objectives were reached and many were even surpassed.

- A nationwide web based platform for all physics teacher training activities has been established (see Fig. 1). Within this platform, not only newly initiated courses are listed, but a very detailed and extensive list of all known activities concerning physics teacher training courses within Germany as well. This led to a detailed calendar with many hundreds of listed activities.
- Within this platform the realization of an easy to use graphical physics teacher training map of Germany (see Figure below) was possible. Clicking on a state within Germany opens up a new map with a list of towns where activities can be found immediately.
-

Interactive map of Germany used for Fobinet. Moving the mouse across the map leads to highlighting of the respective state (here Niedersachsen), already indicating how many seminars are listed for the near future. Clicking on a particular state of Germany opens up a new window showing all teacher training activities in the respective state with details.

- The manifestation of –so far three – regional centers with permanent training offers of usually at least 1 event /month was possible.
- Numerous new activities in form of single or regular events have been planned and organized.
- A very valuable data base of experts being able to offer training courses for science teachers in several fields of physics and physics education and for all school levels, an expert pool, is now available for future use.

In particular regular teacher training activities at the same location lead to networking of teachers. They communicate and share their ideas and teaching concepts. This networking – although only being a secondary effect of regular events is intended. It leads to more feedback and new input which is very helpful, e.g. for finding new and needed topics and thus helps to establish a dynamic process of teacher training activities.

Two examples shall illustrate some of the many activities. Fobinet often funded expert presentations at large school teacher meetings on physics topics. It led to a scheme called "jour fixe" in the city of Berlin, where each month, at a regular day and time, teachers meet in the afternoon for presentations or workshops by experts, dealing e.g. with special topics like, e.g., climate change and renewable energies. Fobinet as coordinating organization was also able to use synergetic effects e.g. by having experts given a number of talks in neighboring cities. This happened e.g. for topics on astronomy during 2009, the international year of astronomy.

A story of success:

- Within the three years project, more than 500 single events were funded, many of them in the second and most in the third year after the start up phase.
- Overall more than 2200 teacher training activities within German are listed in the data base.
- Overall more than 20 000 teachers have been reached, i.e. have attended courses.

The success of Fobinet even led to some unofficial kind of certificate, the Fobinet approval for an activity and even partner institutions asked whether they could get the Fobinet approval for their activities.

It is our sincere hope that now, after the regular and official ending of the three year project Fobinet in April 2011, the ground has been laid for successful follow up programs. First ideas for funding opportunities seem promising and we are confident that those who wish to initiate and organize physics teacher training activities in their region will also get funding in the future.

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Continued from page 2 …..

We need to know and share the knowledge with all the people how best to reduce the radiation risks and how to live with the presence of the radioactive contamination.

We also believe that increased effort in strengthening international collaboration in education is essential.

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International Conference on Physics Education, 2011
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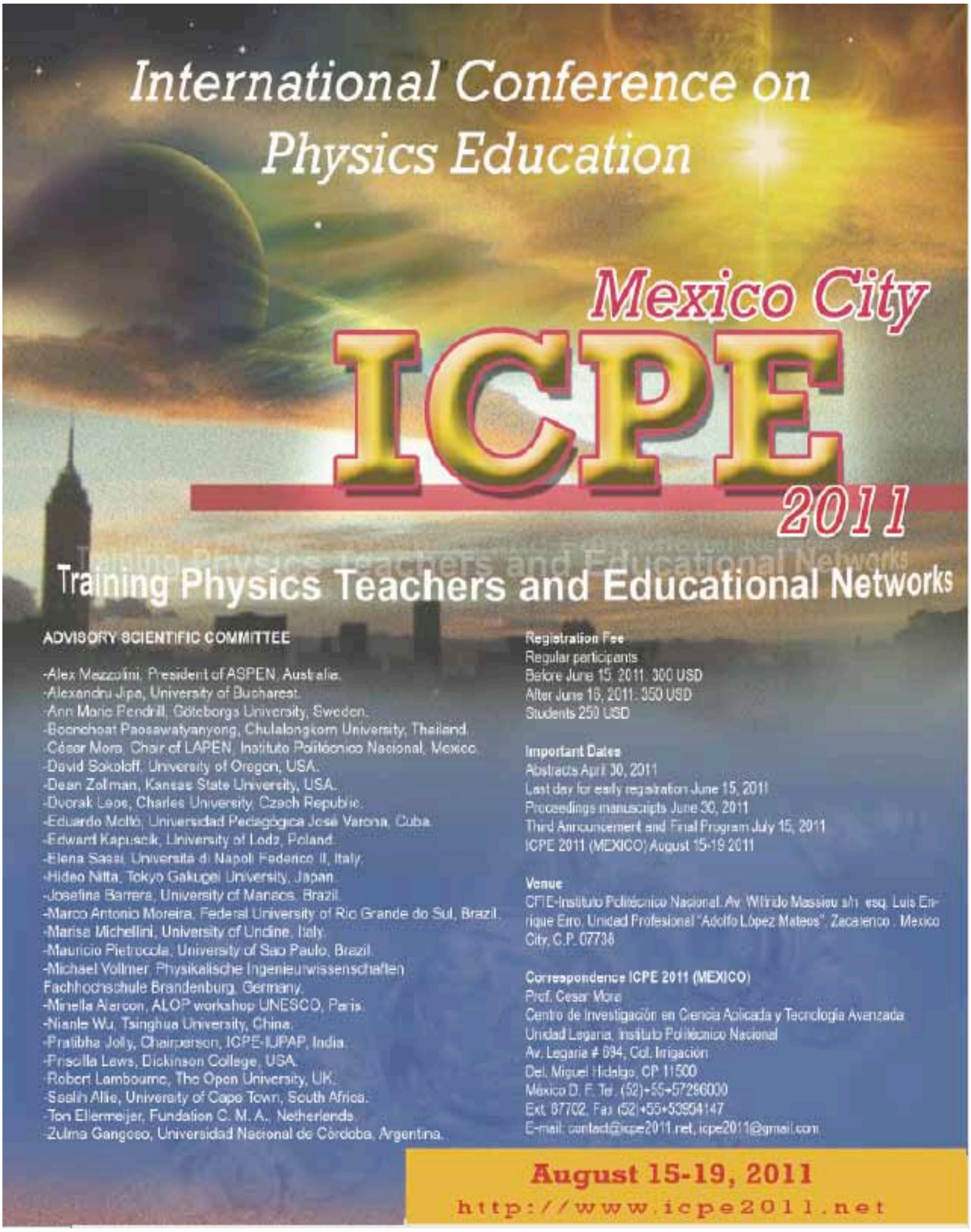

The 2010 ESERA Summer School in North Italy

Marisa Michelini, University of Udine, Elena Sassi, University "Federico II" of Napoli and RosaMaria Sperandeo, University of Palermo

In the framework of ESERA (European Science Education Research Association), every other year summer-schools for science education PhD students are held, (see: http://www.naturfagsenteret.no/ esera/ esera/summerschool.html)

In the summer school in York, United Kingdom, (24-29 August 2008) and the one in Braga, Portugal, (15-22 July 2006), lectures and workshops were provided, and the research work of the PhD students was discussed with their colleagues and experienced researchers. The 2010 summer school was held at the University of Udine, Italy, 25-31 July, organized by the local research unit in Physics Education (URDF), the responsible professor was Marisa Michelini.

Fifty PhD students out of one hundred applications from nineteen countries were selected by 2/3 referees from a committee of one hundred eighty academics. The staff of the ESERA10 Summer School consisted of 18 academics from 9 countries, 3 observers who monitored the activities, 15 personnel from the University of Udine supporting the organization.

An intense programme was proposed:

- four general talks: given Costas Constantinou, (Cyprus); Hans Niedderer, (Sweden); Vanessa Kind, (UK); and Dillon, (UK)

- five workshops on topics including: statistical methods and quantitative studies, Using SPSS, and analysis data structures by Principal Components Analysis; strategies for analyzing qualitative data; teaching/learning activities on Nature Of Science.

- seven group works where small groups (seven PhD students coordinated by two senior academics) have discussed the research projects and the preliminary results obtained.

The research work of the participants included:

- Science Learning focused on contents in a science area (8);
- Science Teacher Education (8);
- Cultural /social Issues. History, Philosophy (7);
- Curriculum, Evaluation, and Assessment (5);
- Science learning in different contexts (4);
- ICT and computer Based learning (3).

New initiatives include:

- website of the ESERA10 Summer School (http://www.fisica.uniud.it/URDF/Esera2010);
- poster by each student participant;
- an emblematic, small exhibit of recent researches of local Physics Education research unit;
- a booklet on the ESERA10 activities;
- an evaluation questionnaire; and
- an excursion and social dinner in famous Aquileia and Grado.

Globally, according to the feedback by the students and the staff, the ESERA10 Summer School in Udine was a successful event that helped fifty PHD students to improve their research lines in science education and to create new links.

Champagne Flows at Reims Event: Report of the GIREP-ICPE-MPLT Conference, August 22-27, 2010, Riems

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Gorazd Planinsic, Faculty of Mathematics and Physics, University of Ljubljana, Slovenia
Michael Vollmer, University of Applied Sciences Brandenburg, Germany

In August, several hundred physicists and physics educators from all over the world gathered for an international conference in Reims, France. GIREP-ICPE-MPLT 2010 was a joint event of three different organizations, the Groupe International de Recherche sur l'Enseignement de la Physique (GIREP), the International Commission on Physics Education (ICPE) and the group on Multimedia in Physics Teaching and Learning (MPTL).

Celebration of bubbles

The city of Reims is the centre of Champagne. This importance is visible nearly anywhere in and around the city. In Reims you can find the only full professorship devoted to the scientific study of champagne. Even the podium lights in the main lecture hall in the conference centre were throwing champagne-fluteshaped projections on the wall. Two of the conference excursions were related to champagne. One took participants to a winery in the neighbourhood, another one led to the champagne-making wine cellars of a famous champagne producer within the city.

Pratibha Jolly among the champagne flutes of light.

These studies already anticipated one of the following day's lectures. Philippe Jeandet talked about the physics behind the bubbling properties of champagne, from the birth and ascent in the glass (did you know that the volume of a bubble can increase by a million during the ascent?) until they finally burst on reaching the surface. Physical measurement methods and modelling are used to study many different aspects of champagne bubbles: what differences can be observed between the ascent of beer and champagne bubbles? Mass spectrometry is used to study the molecules inside and outside the bubbles, and lasers are used to identify the molecules in the aerosol formed when bubbles burst. The chemistry of the bubbles is found to be affected by differences in flow, in turn caused by the shape of the glass.

Plenary talks

- Raimund Girwidz from the MPTL group presented the annual review of multimedia resources for physics teaching through compadre.org.
- Laurence Viennot talked about the importance of creating conceptual links to children's observ-ations in inquiry-based science education (IBSE) and showed results where 10 year olds were found to have a decreased interest in science after an IBSE project, in spite of the intentions of the project.
- Gorazd Planinsic demonstrated challenging optical behaviours of a prismatic foil from an LCD computer screen and showed how it can be used to probe student reasoning as well as that of the audience.
- Eugenia Etkina challenged us to use the physics concepts as a context for learning to think like a scientist and showed that engaging students in experimental design helps them learn physics.
- Ruth Chabay showed how computational modelling by VPython could be connected to introductory physics instruction.
- Manfred Euler's presentation included a challenge to our views of the images of physics, reproducing the 'iconic images of nanoscience' with similar images produced by acoustic wave scattering.
- Sebastian Dormido Bencomo talked about virtual and remote labs, their characteristics and directions of development. He also described an inter-university project known as AutomatLabs.
- Albert Fert, who was awarded the 2007 Nobel Prize in Physics together with Peter Grünberg, took us into the exciting world of spintronics, that exploits not only the charge but also the spin of the electrons.

Parallel sessions, workshops and posters

Large conferences always force participants to choose between parallel sessions, workshops and symposia. Here are a few examples we enjoyed—well aware that we missed many others that we would have enjoyed. The project Eurodiffusion makes use of the different symbols found on the coins representing the nation of origin. How fast do coins migrate in Europe?

Mojca _epi_ from Slovenia described how the study of the distribution of coins with different origins in wallets of Europeans can turn into a collaborative project, showing for example when new coins are released in a particular country, the extent of international exchange and the relation between the sizes of different economies..

How does weightlessness feel? What is it like to experience artificial gravity in a rotating space station? Igal Galili from Israel told of experiments with Israeli pupils in grades 7 and 9, who had experienced 'thinking journeys' to unusual situations, which this could avoid having everyday conceptions getting in the way of physics understanding.

Peter Hubber from Australia spoke about professional development of biology teachers to prepare them for physics teaching. He described how one of the teachers had used plasticine in a class to introduce the concept of force, asking the class to write down different ways to change the shape of the plasticine.

Jochen Kuhn from Germany discussed authentic assignments, connected to newspaper articles. They had found that the students were able to read more complicated text when the tasks were authentic and engaging—and then learned the physics better.

A series of several talks was devoted to the new field of high-speed imaging. Michael Vollmer gave an introduction to the technology of modern high-speed cameras and also compared results of a number of simple hands-on experiments recorded with both a scientific-quality camera and a Casio Exilim camera.

Irena and Leo_ Dvorak from the Czech Republic kept participants active at their Heureka workshop, entitled 'What is the wick in the candle for?' In the workshop by Lady Cats, female physics teachers from Japan demonstrated simple and beautiful experiments, some of which were given to participants to take home.

Poster sessions can be extremely useful, especially when there is a time and place to discuss the posters that researchers have given their effort and thoughts to produce. During this conference, the poster time was restricted to informal discussions during breaks.

Birthday celebration before departure

The end of the conference marked a birthday celebration: the 50th anniversary of the International Commission for Physics Education (ICPE, http://web.phys.ksu. edu/icpe/), which is one of the commissions of the International Union of Pure and Applied Physics (www.iupap.org).

This event was celebrated with the launch of the printed version of the ICPE book Connecting Research in Physics Education with Teacher Education Volume 2, edited by Matilde Vincentini and Elena Sassi, past and present commission members.

During the final plenary session of the Reims conference, the 2006-2011 chair, Pratibha Jolly, gave an overview of the history of the commission and also talked about the future outreach activities, in particular the hands-on workshop PHYSWARE, which is to be organized in 2012 and 2014 at ICTP in Trieste, following a 2009 pilot workshop.

The next GIREP-EPEC conference will take place in Jyvaskylla, Finland, in August 2011 (www.girep.org/), MPTL will meet in September 2011 in Ljubljana, Slovenia (www.mptl. eu/workshops.htm) and the next ICPE conference will be held in Mexico City in August 2011 (www.icpe2011.net/).

ICPE – IUPAP

International Commission on Physics Education
International Union of Pure & Applied Physics

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