



# International Newsletter on Physics Education



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## ICPE Chair's Corner

Welcome to the 63rd International Newsletter on Physics Education. This edition comes at a time when many of us are preparing for this summer's international academic conferences. Papers are being written, demonstrations planned, posters printed and practical matters attended to such as the booking of air tickets and hotel rooms.

This summer members of ICPE will be meeting in Istanbul, directly after that city hosts the World Conference on Physics Education, which runs from 1-6 July 2012. Consequently many of my recent e-mails from the Commissioners have concerned the practicalities of our planned meeting; ensuring we are staying in the right part of the city, that we can meet and communicate outside of the Conference, and that we don't make travel plans that conflict with our work for ICPE. I think most of the Commissioners have now managed to resolve these issues but I hope that many of you, our readers, are also planning to attend the World Conference and I look forward to seeing you there. I hope to be fairly visible during the Conference, so if your only link with ICPE up until now has been through this newsletter please seek me out and introduce yourself. It will be a pleasure to meet as many of the Newsletter's readers as possible and to get to know your particular interests, activities and insights in the wide world of educational physics.

It's tempting at a time like this to devote part of this Chair's Corner to the subjects I expect to be talking about at this year's conferences but rather than do that I actually want to write about an older interest of mine; one that is never far from a writer's thoughts, and one that is relevant to all conferences - words and meanings.

Over the years I have become increasingly convinced of the importance of words in physics education. Most physicists are fully aware of the prominence of quantitative problem solving in our field, and few need any convincing of the importance of equations and mathematical accuracy. Words, though, are a different matter. Some feel that the use of clear definitions and precise terminology is vital to effective scientific communication and that the lack of clarity and precision is a major barrier to effective teaching and learning. Others take a more relaxed view, espousing a less formal

approach that tries to get across the big picture but ignores the finer details on the grounds that they can be dealt with later, or left until they arise naturally in a mathematical discussion that must inevitably be more precise. Of course, no-one wants to say anything that is actually wrong but there is a valid debate to be had about where any particular piece of teaching should sit on the spectrum between overly pedantic and misleadingly loose. A target adopted by many in introductory presentations is to make things 'as simple as possible but no simpler' but achieving this is not simple and many would regard it as central to the art of good physics teaching at all levels, from primary schools to postgraduate seminars.

One area in which the issue of words and meanings is particularly prominent is the study of energy. This is a topic that plays a role at every level of physics education. Postgraduates can be asked to consider whether or not energy is conserved in Einstein's general theory of relativity while seven-year olds can discuss the 'using-up' (or otherwise) of energy by a glowing lamp.

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Of course energy is not a term that physicists can keep to themselves, it is also used in the other sciences and is also a common term in society generally, cropping up in everything from the economics of 'energy companies' to the marketing of breakfast cereals.

In all cases, at whatever the appropriate level of language and sophistication, a fundamental question for teachers of physics is: 'What is energy?' Other issues such as the conservation, conversion and consumption of energy follow on from this one definitional question.

In the UK, at the Education Department of the Institute of Physics, much thought is now being devoted to energy as attempts are made to find ways of improving the teaching and learning of 'energy' at a variety of levels.

The main issue is how to represent energy in official curriculum documents so that errors in past thinking are exposed and deliberate and benign linguistic looseness is prevented from becoming inappropriate and harmful license. There is a strong feeling that too many school-level discussions of energy have fallen into the trap of treating energy as a 'thing'; substance-like in its ability to be transferred from one body to another yet chimerical in its ability to change its 'form' from being 'kinetic' to 'electrical' to 'chemical' to 'potential' and so on. The concern is that this concretization (a better word is probably reification) of energy not only leads to science fictional exaggerations such as 'alien beings made of pure energy' but also, at a more mundane level, to the common error of thinking of energy as an agent of change, something that causes change rather than simply reflecting it. When the temperature in a room drops, is the declining energy of the air a cause or an effect? Is too much energy the reason why young children run wild, and is too little energy the cause of the widespread teen-age reluctance to get up in the morning?

Treating energy as a form-changing 'substance' provides a ready source of discussion topics and assessment questions but it lacks predictive power and even physical meaning. It feels 'scientific' to be able to classify energy into a variety of types or forms yet it lacks real integrity when all we are doing is to label the ways of calculating the energy different physical situations. The book-keeping aspect of energy analysis is of very great importance in physics but it should not be interpreted as indicating real differences in the nature of energy itself. The energy of a system may be used to impose a limit the system's ability to do work but it is not the energy that gives the system its ability to do work, nor, generally speaking, is energy even a good measure of the 'capacity to do work', as is often claimed.

The debate about the best way to teach energy is an old one and is certain to continue. It will be of significance wherever physics is taught and learned, and whatever the advantages or disadvantages of the language being used. For me however it typifies the strength and value of the international effort to improve educational physics at all levels. There are sure to be many discussions of energy related topics at this year's conferences and I expect to be stimulated and challenged by many of them. I look forward to that.

I cannot end this Chair's Corner without commenting on the fact that this will be the last edition of the International Newsletter to be edited by Ian Johnston. ICPE has been immensely lucky to have so talented, innovative and respected an individual as Ian to meet the many challenges involved in assembling, producing and distributing the Newsletter over many years. Despite occasional claims as an Australian of being 'cut-off' from the rest of the world, Ian has a wide variety of friends and contacts all over the globe. I well remember that, when I attended my first international physics education conference in the USA, and met Ian for the first time, it was he who took me under his wing and kindly introduced me to many of the major figures in the field. Since then I have met Ian and his wife on many occasions in various countries and have always found those meetings to be lively and informative as well as thoroughly enjoyable. A particular pleasure has been learning something of Ian's interest in the physics of music, the subject of his fascinating book *Measured Tones*. This is a typically inventive result of Ian's talent as a writer, treating the development of relevant physical ideas alongside their musical applications rather than using one as the basis for the other. One of Ian's many contributions to ICPE and the International Newsletter was arranging the Seven Wonders of Science and Technology survey at the 2007 ICPE conference in Marrakech. Ian himself was not included in the list of potential 'wonders' in that survey but maybe he should have been.

Ian, on behalf of myself, the Commissioners, and all those who have benefited from the Newsletter for the past several years, many thanks for all you have done for ICPE and for physics education around the world.

*RJA Lambourne*

Robert Lambourne

*Thanks Bob, for your kind words. Ed.*

## Physics Education Research in Brazil\*

*Anna Maria Pessoa de Carvalho – School of Education - São Paulo University  
Deise Miranda Vianna – Physics Institute - Rio de Janeiro Federal University  
Laércio Ferracioli – Physics Institute - Espírito Santo Federal University  
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Roberto Nardi – School of Sciences - São Paulo State University,*

*This paper is adapted from a chapter called “Research in Physics Teaching” written by the authors, members of the Brazilian Society of Physics (SBF) Physics Research Commission, in the following book edited by SBF: S. Nogueira; T. Romero (Orgs.). Física 2011: Estado da Arte, desafios e perspectivas para os próximos anos (Physics 2011: State of art, challenges and perspectives for the next years). Sociedade Brasileira de Física, São Paulo: Chris MCHillard Editora Ltda., 2011, p. 115-126.*

### Introduction

The first steps to consolidate the Physics Education Research in Brazil originated in the early 1960's through organizations and educational projects whose main concern was to improve the science teaching. Among them are the IBCEC (Brazilian Institute for Education, Culture and Science) and the FUNBEC (Brazilian Foundation for the Development of Science Education), the first UNESCO organization created to implement the development of education, science and culture at elementary and high schools levels. Right after came the creation of the Centers for the Training of Science Teachers in Porto Alegre, São Paulo, Rio de Janeiro, Belo Horizonte, Salvador and Recife, whose aim was to popularize a new view about science education. At the beginning of 1970, during the 1<sup>st</sup> National Symposium on Physics Education (SNEF), one of the first regular meetings in science education in Brazil, held in São Paulo and sponsored by the Brazilian Society of Physics (SBF), apart from numerous discussions about teaching projects from other countries and proposals for new Brazilian projects, a motion about the need for Physics Education Research was proposed as it was recorded in the proceedings of the symposium:

*“We advise that the Brazilian Physics Society, in collaboration with the Physics Societies in other countries, should prepare a project of Latin American cooperation to coordinate the efforts that are being made on Physics Education Research.” (p. 334)*

The first master programs of Science Education (Physics) were created in the 1970's at the Physics Institutes of the Federal University of Rio Grande do Sul (UFRGS) and at São Paulo University (USP); the last one in partnership with the School of Education. Other master programs were created, as regular concentration lines inside physics institutes and education colleges, gathering professors for the establishment of graduate programs in Science Education. During the 1980's, the SPEC/PACT/CAPES Program, whose aim was to improve Science Education in elementary schools and

high schools, had important role in giving support, both institutionally and financially, to many meetings and research and/or development groups.

In 2000, CAPES (the Bureau for the Qualification of Higher Education Personnel) established its area of Science and Mathematics Education, but many research groups in Physics Education continued to be classified within the Education area. In 2010, the Science and Mathematics Education area of CAPES expanded to circa of 67 graduate programs, formed by 86 courses, 32 of which in masters' level, 20 in PhDs and 34 in professional masters' level; these last ones, designed for in-service science and mathematics teachers.

Thesis and dissertations in the Physics Education field have been produced in many of those programs – five are specifically linked to Physics Education. In the period from 1996 to 2006, in the Brazilian graduate programs, 618 graduation works were concluded, 465 of which in master level, 109 were PhDs or post-doctoral and 44 were professionalizing masters.

### Challenges and Perspectives

The government policies for Science, Technology and Innovation with the aim of sustainable development are inseparable from the improvement of basic education and the continuing education for teachers in Brazil. The changes that are required today, both nationally and internationally, for Physics Education are being investigated by our researchers, whether involving teaching and learning in all its relevant sub-fields or related to the initial and continuing education for teachers. The most important challenge in the Physics Education Research field today in Brazil is to bring the results of research to the attention of policymakers responsible for human resources, since the education, and especially teaching, in the educational field, has always been viewed as just a problem of knowledge of syllabus content, without taking into account the close relationship between teaching and learning. However, research has shown that both, teaching and learning Physics, is much more than just transferring syllabus content from one level to the other.



## Brazil in this field



*Figure 1 \*: The Cidade Maravilhosa or “Marvellous City”, Rio De Janeiro, is the second largest city of Brazil, and the third largest metropolitan area in South America,*

Brazilian journals designed for Physics Education Research are evaluated by Qualis/CAPES system. The Revista Brasileira de Ensino de Física (Brazilian Journal of Physics Education), published by the Brazilian Physics Society (SBF) since 1979, and the Caderno Brasileiro de Ensino de Física (Brazilian Review of Physics Education), published by UFSC (Federal University of Santa Catarina) since 1984, have as their subject matter both Physics Education and Physics Education Research. With the growth of the field, other journals arose in Brazil, whose purpose was to publish only articles about Science Education Research. In 1995 *Ciência & Educação* was created by the Bauru campus of Unesp (São Paulo State University). The journal *Investigações em Ensino de Ciências* (Investigations in Science Education) appeared in the following year, 1996, created by UFRGS. In 1997 the Brazilian Association of Science Education Research (Abraspec) was created, and one of its goals was to publish the *Revista Brasileira de Pesquisa em Educação em Ciências* (Brazilian Journal of Science Education Research). In 1999, UFMG (Federal University of Minas Gerais) started to publish the journal *Ensaio: Pesquisa em Educação em Ciências* (Essay: Research in Science Education). All those journals are published thrice a year and have as their main goal the dissemination of research results in the Science Education field.

The Center for the Documentation of Science Education (CEDOC), coordinated by the FORMAR-Ciências (Study and Research Group in Continuing Education for Science Teachers), based in the Education College of Unicamp (State University of Campinas), has developed since 1987 a service that identifies, classifies and disseminates Science

Education Research, especially the results of thesis and dissertations. As a result of this work the group edited in 1998 the catalogue *O Ensino de Ciências no Brasil: Catálogo Analítico de Teses e Dissertações (1972-1995)* (Science Education in Brazil: Analytical Catalogue of Thesis and Dissertations), putting together abstracts of 572 thesis and dissertations defended until 1995. The PROFIS Group (Support, Research and Cooperation for Physics Teachers), from the Physics Institute of the University of São Paulo, has published three volumes of the *Catálogo Analítico de Ensino de Física no Brasil: dissertações e teses* (Analytical Catalogue of Physics Education in Brazil: dissertations and thesis), including the periods 1972-1992, 1992-1995 and 1995-2006. The three volumes contain 891 references among master dissertations and doctoral thesis about Physics Education, developed in Brazil.

## Relevance for Society

The first Meeting of Physics Education Research (EPEF) in Brazil happened in Curitiba, Paraná State, in 1986. The EPEF have happened systematically every two years; the most recent one being held at Águas de Lindóia, São Paulo State, in 2010.

Taking into account the four meetings occurred between 2002 and 2010, we can conclude that Physics Education Research has shown a linear growth in that period. The sub-fields with most works are “Teaching and Learning” and “Continuing Education for Teachers”, reinforcing the interaction between Physics Education Research and the problems of teaching and continuing education at elementary, high school and college levels.

Research on the processes of teaching and learning science in Brazil was systematized during the 1970’s, with investigations about the alternative conceptions students had on the nature of the several areas of Physics, such as mechanics, electricity and magnetism, optics and thermodynamics. However, since the mid-1980’s, considerable attention was given to research on the concepts students and teachers have about the nature of science. Such researches showed that, just like the concepts about specific contents, they are also limited and often naïve. By the late 1990’s, discussions about teaching and learning were boosted by the results of evaluation programs, both international (PISA) and national (ENEM), that showed that students performed much worse than expected, either in public or private schools. Those results brought new impetus to research on teaching and learning science, and the concepts of “Scientific Literacy” and “Science, Technology and Society” (CTS) were introduced in the discussions of this field, as an effort to enhance science education. CTS research has preferentially focused on changing curricular structure, while



research on Scientific Literacy has studied aspects of language in didactic materials and the interaction of teachers and students in the classroom.

### Language and Scientific Literacy

A review of research in this field shows a theoretical shift in the role of language in science education and the framework used to study oral and written language in science teaching and learning. The advent of cognitive science, the input from philosophers and linguists, the recognition of the limitations of the “stimulus-response-reinforcement” perspective, the emphasis on social construction/transmission and also the understanding of the role of language in that process has widened the understanding of the processes of teaching and learning science. Another important contribution comes from the exploration of the connections between mental models, language and learning in science, influenced by history and philosophy of science, by studies of human cognition and the application of technological information and communication. Spoken and written languages are the symbolic systems that are most frequently used in building science itself and in building, describing and presenting the scientific processes and arguments. Doing science, to speak about science, to read and write science it is necessary to articulate in manifold ways verbal discourse, mathematic expressions and graphic representations. Those abilities and competencies also need to be developed in science education. It is by searching the “how” of achieving such relationships that research in this field is being developed.

### Technology and Physics Education

Research in this field is motivated by the search to integrate tools of information technology and communication with the processes of teaching and learning. What one observes in practice is that those tools became restricted to the use of computers and other information technology resources, such as Internet applications. Since the focus of investigation has been the use of those tools (teaching) and not the Physics content (learning), results are still limited, but very promising if learning becomes the focus. The main aspect of this field of investigation, not only for Physics Education, but for all areas that may be involved with these themes, is that the technological tools have redefined the class room space, widening it beyond the school walls and beyond teachers’ sole control. Another important slope of work is the integration of computer modeling and scientific visualization in approaching Physics topics in a theoretical or experimental perspective. This approach is being used both to understand the process of building scientific knowledge through models and the

process of corroborating or refuting models, built through visualization and analysis of graphic output of predicting expected outcomes. Many national and international commissions on science education have highlighted those new goals and the growth of the role of technology in science education.



*Figure 2 \*: The Iguazu Falls are located where the Iguazu River tumbles over the edge of the Paraná Plateau. They mark the border between Brazil, Argentina, and Paraguay*

### Continuing education for teachers

Education researchers have always seen the teacher as an important actor and mediator of the learning conditions in the classroom. Today, an almost natural consequence of research on teaching and learning, scientific literacy and technology in Physics Education is education for teachers, both in their formative years and continuing education.

Taking into account results that showed that the directive and unidirectional teaching, in which the teacher speaks and the student hears, is successful only with students that are already gifted to learn Physics, an important question was posed: how to prepare teachers for a kind of basic education that is not directed to an elite, but to all citizens?

On the other hand, research also shows that, to achieve the goals proposed by current national and international curricular tendencies, it is necessary to greatly diversify education strategies and particularly to create learning environments that allow students to reason during classes, since teacher/student and student/student interactions are essential conditions for learning the various scientific languages: oral, graphic, symbolic, mathematic and computational.

Research on teachers’ capacity building has shown a great discrepancy between attitudes and behaviors during classes they frequented and the classes in which they themselves acted as teachers.

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## Welcome to new commissioners.

*As laid down by the IUPAP by-laws, the term of office for all general members of the ICPE is for a term of three years, with the possibility of re-election once. At the IUPAP General Assembly held in London, UK, October 31– November 4, 2011, six new members were elected. We welcome them to the Council, and hope that they enjoy their period of service with us.*

### Dimitry Khokhlov



Let me introduce myself. For the last 30 years, I am working at the Physics Department of the Moscow State

University. I am a Professor of Physics since 1997 and head of the Chair of General Physics and Condensed Matter Physics since 2006. Our Chair specializes in teaching physics for non-physicists in our university. Beside that, I give lectures on the basics of solid state physics for undergraduates at the Physics Department, as well as lectures on different aspects of solid state physics at two other departments of the Moscow State University. My scientific research deals with the semiconductor physics including physics of narrow-gap semiconductors, development of ultra-sensitive detectors of terahertz radiation, organic semiconductors, physics of composite structures with semiconductors, quantum dots, and other areas. Since 2004, I am deputy head of the methodological council in Physics in the Educational-Methodological Union on the classical university education. In fact, this council is a union of deans of physics departments of all classical universities in Russia. One of the major things that we have done recently was development of standards of higher education in Physics. At this time, these standards are in action, and every university teaching physics in Russia must conform them

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### Priscilla Laws



I am from the United States of America: I completed my Ph.D. work in Nuclear Physics at Bryn Mawr College in Pennsylvania in 1965. Since then I have been member of the Department of Physics and Astronomy at Dickinson College in Pennsylvania. At Dickinson, I have taught physics and interdisciplinary courses and developed curricular materials, apparatus, and computer

tools to support active learning based on the outcomes of Physics Education Research. Publications that I have contributed to include Workshop Physics Activity Guides, RealTime Physics Laboratories, a textbook entitled *Understanding Physics*, as well as a book and CD entitled *Physics with Video Analysis*. I have helped design apparatus (such as a Syringe-Based Heat Engine and Chaotic Oscillator) and software for the collection and analysis of video data. I have also co-taught many physics education workshops for teachers in the USA as well as UNESCO workshops for teachers from other countries.

I am a member of the American Physical Society (APS) and the American Association of Physics Teachers (AAPT). I served as a co-chair with Pratibha Jolly of the Education Committee for the 2005 World Conference on Physics and Sustainable Development. Since then I served on the instructional team for an ICTP workshop entitled Physware-- an international workshop on the use of low-cost equipment and appropriate technologies to promote hands-on physics education throughout the developing world. I have received several awards for my educational work including the ICPE 2008 Medal in recognition of distinguished contributions to Physics Education with far reaching international impact.

I am excited about the opportunity to work with you on promoting physics education throughout the world!

### Deena Naido



I am a Senior Lecturer in the School of Physics, at the University of the Witwatersrand (WITS), Johannesburg, South Africa, and my primary research interest is in Nuclear Solid State Physics, in particular Mossbauer spectroscopy of diamond, oxides and semiconductors. My projects involve source based work at WITS and radioactive beams at ISOLDE, CERN, Switzerland. A number of MSc and PhD students are involved in these programs. My passion and interest for Physics Education has evolved from teaching of foundation students in the

College of Science, WITS where the interaction with small groups brought to the realization of the many learning difficulties experienced by them. In particular, is the issue of problem-solving in Physics which constitutes the main component of my PhD student's research. I teach Physics at all levels from first year to Honors levels.

I am also involved with on-going curriculum development of lectures, tutorials and practical manuals for large classes (>400) and as a Physics Education spokesperson to the council of the South African Institute of Physics (SAIP). This role has been ongoing over the last 5 years and I have encouraged academics from South Africa to participate in Physics Education activities. Besides the above, I have written TV scripts for school learners in Africa and distance education courses. At the university, I serve as the Physics representative in the Faculty of Science Undergraduate Committee, the Faculty Board of Science, the School of Physics and Faculty of Science Teaching and Learning Committee and as a member of the School Physics Executive committee. I have organized a number of local & international conferences/workshops at the university, within South Africa and in Europe. I am also the Faculty of Science School Liaison representative and the co-ordinator of outreach activities for the DST/NRF Centre of Excellence in Strong Materials, here in South Africa which involves school learners.

I am very excited to share, learn and promote ideas on Physics Education!

Finally, my web address is:

<http://www.wits.ac.za/staff/deena.naidoo>

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### Sile NicChormaic



I am happy to serve with you all. My brief background: I am from Ireland and did my BSc and MSc there, followed by a PhD in atomic interferometry in Villetaneuse, Paris. From there I have worked in Austria, Australia and Germany as a researcher but always with a strong interest in physics education promotion. In 2000 I returned to Ireland where I lead a research group in Quantum Optics and am employed by University College Cork. I have a visiting affiliation with the new Okinawa Institute of Science and Technology, Japan where I have been helping them establish a physics graduate PhD programme. I also hold an honorary position in UKZN, South Africa where I co-supervise graduate students in experimental physics.

I am excited to have an opportunity to be involved with this international commission and hope that my international experience can bring something to the table.



### Roberto Nardi



I am very happy to be elected as a member of this important Commission and to work with all of you for these next years. I look forward to sharing our experiences built here in Brazil in the last decades in Physics Education and Physics Teachers' Education, and I hope to learn also a lot with all of you.

I am Associate Professor at the School of Sciences (FC), Education Department, in the State University of São Paulo (UNESP), a multicampi university ([www.unesp.br](http://www.unesp.br)) spread all over the state, with circa of 3.500 professors, in 23 campi, 33 faculties and institutes and 3 technological high schools.

I work at the Bauru Campus ([www.fc.unesp.br](http://www.fc.unesp.br)); a city with around 380.000 people, 300 km from São Paulo City, the most important city in this state, and in Brazil.

UNESP is a large university in Brazil, one of the three state universities in São Paulo (USP and UNICAMP are the other ones). It has 120 undergraduate programs, 187 graduate programs and about 50.000 students, 10% of them involved in master and PhD programs.

After finishing my undergraduate program at UNESP in the 70's, I graduated in masters' level (1978) in Science Education at Temple

University, Philadelphia, Penn-sylvania, USA, and coming back to Brazil, I worked for 12 years at the Physics Department of the Londrina State University, in Parana State, coming to UNESP afterwards, in 1995.

I concluded my PhD in 1990 at São Paulo University (a study on the psychogenesis of the field of force concept), and I spent two year (2003-2005) in a postdoctoral program at UNICAMP, when I studied the origins and consolidation of the research in science education in Brazil. In this study I interviewed 30 selected former physics, chemistry, biology and geology science education researchers, considered founders of this area of research in the country (Today Brazil has around 70 graduate programs in Science Education; our program here at Unesp was one of the pioneers in Brazil).

Currently I am a level I-C researcher at CNPq – Brazilian National Research Council ([www.cnpq.br](http://www.cnpq.br)), member of the Physics Education Research Commission of the Brazilian Society of Physics (SBF – <http://www.sbfisica.org.br/v1/>) and Physics and Science Education Research Group leader at UNESP.

In the last recent years I was the Coordinator of the Science and Mathematics Education Division in the Post Graduation Evaluation System at CAPES ([www.capes.gov.br](http://www.capes.gov.br)) – Coordination for the Improvement of Higher Education Personnel (CAPES/DAV) – Ministry of Education – Brasília – (2008-2011). I was also former President (2003-2005), Vice President (2001-2003) and founder of the Brazilian Association for Research in Science Education – ABRAPES (<http://www.nutes.ufrj.br/abrapec/>).

I worked also in the Teachers' Education Development Program (Physics, Chemistry, Biology and Mathematics) Advisory Committee – Brazilian Ministry of Education (MEC/SESu) – Brasília - Brazil – (2001-2003). In the 90's I was Secretary for Teaching Affairs of the Brazilian Society of Physics – SBF - (1991-1993). I was also the founder (1997) and the Dean (1997-2000; 2003-2005) of the Science Education Graduate Program at UNESP. In this Program we edit the *Ciência & Educação Journal* ([http://www.scielo.br/scielo.php?script=sci\\_serial&pid=1516-7313&lng=es](http://www.scielo.br/scielo.php?script=sci_serial&pid=1516-7313&lng=es)).

I have participated in several Science Education projects in Brazil, the majority granted by institutions like CAPES (PADCT/SPEC, Prociencias), FAPESP, FUNDUNESP (PEC/FOR/PROF), CNPq, FINEP and others. I have been responsible also by various teachers' training courses and invited for many advisory boards of public institutions about questions involving science and physics education.

In the last decades I have advised graduate students in masters level (13), PhD level (11), Post Doctoral (3) Scientific Initiation (7) in subjects related to Physics Teaching and Physics Teachers' Education.

I have participated as president, member, chair or invited in

several important scientific events, in Brazil: SNEF - National Symposium on Physics Teaching: from the IV SNEF (Rio de Janeiro, PUC, 1979) to Physics Education Research: I EPEF (Curitiba, UFPR, 1983) to the XII EPEF (Águas de Lindóia, 2010); ENPEC – National Science Education Research Congress: I ENPEC (Águas de Lindóia, Abrapec, 1997). The VIII edition will be held in Campinas, in December, 2011.

In international level I have participated in the IACPE – Inter-American Conference on Physics Education (V, Texas A&M, 1994; VII, Brasil, 1997; VIII, Havana, 2003; X, Medellin, 2009), ICPE (Mexico, 2011), ESERA – European Science Education Research Association Conference (Barcelona, 2005; Malmö, 2007; Istanbul, 2009),

the XIX SNEF (Manaus, UFAM, 2011); IV and V Summer School of Science Teaching Practice (UNESP, Bauru, 2000, 2002), EPEF – National Congress on

IOSTE – International Organization for Science and Technology Education (XI, Poland; XIII, Turkey), Congreso de la Enseñanza de las Ciencias (Barcelona, 2001; Granada, 2005; Barcelona, 2009) and others. My academic production can be accessed at the Lattes homepage (CNPq): <http://lattes.cnpq.br/4449947783474945>

As I said before, I hope to exchange this experience with all of you. Knowing all your precious experiences, I am sure we will have the opportunity to help improving the physics teaching throughout our continents.

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### Lotten Glans



Lotten Glans was born in 1967. She obtained her B.Sc. in Physics in 1988, and her PhD in Quantum Chemistry in 1993, both from Uppsala University. After her PhD she was a postdoc in atomic physics at the University of Tennessee, in Knoxville, studying highly charged ions interacting with surfaces. In 1996 she began a position as Postdoctoral research fellow in theoretical atomic physics at Stockholm University. In 1999 she

moved to Sundsvall, where she had obtained a position as a Senior Lecturer in Physics at Mid Sweden University, and in 2002 she was promoted to “docent”. She is married to Peter Glans, and they have two children born in 2000 and 2002. Since 2006 she works as a Faculty Programme Director at Mid Sweden University.

Lotten has taught physics for many years at university level. One of her main interests within the area of teaching is the connection between teaching natural sciences and technology at upper secondary level schools and at universities. Lotten has been the university representative in groups working with recruiting more pupils to natural sciences and technology, in collaboration with local upper secondary schools and industry. Lotten has been one of several reference persons for natural sciences and technology on a national level when the Swedish National Agency for higher education has developed new upper secondary school programmes.

Since 1998 Lotten has worked with quality assurance issues in education. She is the coordinator at Mid Sweden University of quality reviews of education in science and engineering, carried out by the Swedish National Agency for Higher Education. For many years she worked as a coordinator for the Master of Science in Engineering Programmes at Mid Sweden University. She has also worked with third cycle education and research issues at a Faculty level.

Lotten is a member of the Swedish Physical Society and has been active as a secretary for a few years in the 1990s. In 2011 she became the chair person of the section for Women in Physics in Sweden.

### Gorazd Planinsic



Gorazd Planinsic is Professor of physics at the Faculty for mathematics and physics, University of Ljubljana, Slovenia. His PhD and initial research field covered MRI in low (Earth) magnetic field, NMR coil design and noise /interference reduction. In 1996 he co-founded first Slovenian hands-on science centre, House of Experiments, which turned his career

towards physics education. Today he is devoting most of his time to physics education including PER. His main interest is in development of experiments (particularly simple experiments) and their innovative integration into active learning methods. He is also interested in how students develop mental models when they observe or work with experiments and how knowledge about this can help us to improve experiments and experiment based teaching methods.

Dr. Planinsic has led a Physics education course for undergraduate and postgraduate students for more than twelve years. In addition he also leads the Continuing education programme for Slovenian in-service physics teachers. Dr. Planinsic is currently a chair of the Committee for national exam (matura) in physics in high school and he has been involved in recent national curriculum reform for high school physics in Slovenia. He is a chair of EPS Physics Education Division and member of MUSE group, which works within EPS PED. Gorazd was serving as a secretary of GIREP from 2002-2010. He is author of a textbook for future physics teachers, author of many papers in international journals and a member of editorial boards of Physics Education and European Journal of Physics.

### Jayashree Ramadas



I am happy to work with this interesting and distinguished group.

I am from India: a professor of science education and, since July 2011, Centre Director of the Homi

Bhabha Centre for Science Education, Tata Institute of Fundamental Research, Mumbai. I have a B.Sc. in Physics from the University of Poona, 1974, an M.Sc. in Physics from the Indian Institute of Technology, Kanpur, 1976, and a Ph.D. in Science Education from the Homi Bhabha Centre for Science Education, 1981.

I have worked in development and evaluation of school science curricula, and done research on classroom interaction, students' conceptions in physics and biology, and visualisation in science education. I have led the development of the Homi Bhabha Curriculum for Primary Science, which consists of Text, Work and Teacher's Books titled "Small Science", published in four Indian languages. I served on the National Curriculum Framework 2005 Science Focus Group and have been a member of the the Inter-Academy Panel's International Oversight Committee for Inquiry-Based Science Education. My current research is concerned with visuo-spatial thinking in science, including the use of diagrams and gestures. I guest-edited a 2009 special issue of the International Journal of Science Education on this emerging research area.

I look forward to working with ICPE.





WCPE

The World Conference on Physics Education

July 1-6, 2012 Istanbul / Turkey

## Welcome to the World Conference on Physics Education

We are looking forward to seeing physics educators, teachers, researchers, and policy makers from around the world at this very first World Conference on Physics Education to be held in Istanbul in July 2012. The conference was initiated by **Groupe International de Recherche sur l'Enseignement de la Physique (GIREP)** and the **International Commission on Physics Education (ICPE)** – Commission 14 of the **International Union for Pure and Applied Physics (IUPAP)**. It is being sponsored by **GIREP**, **ICPE** and the **Multimedia in Physics Teaching and Learning (MPTL)** group and endorsed by **American Association of Physics Teachers (AAPT)**, **Latin American Physics Education Network (LAPEN)** and the **Asian Physics Education Network (AsPEN)**.

The vision for **2012 World Conference on Physics Education** is to follow a global participative process before, during and after the conference. The Conference will be structured to help foster collaborations on physics education research and development which can transcend national boundaries. The goal will be reached through working sessions which will develop actions plans that strengthen the teaching and learning of physics at all levels and in many countries.

The **2012 World Conference on Physics Education** will be a concrete step forward in global cooperation. Envisaged as a series of conferences with a four year periodicity, it would be a working conference with follow-up actions that presumably would carry over to the following conference.

Conference theme:

## The Role of Context, Culture, and Representations in Physics Teaching and Learning

### IMPORTANT DATES

Early Registration Deadline	April 30, 2012
Registration Deadline for inclusion in the program	May 25, 2012
Announcement of the Final Conference Program	June 8, 2012
Conference Dates	July 1–6, 2012

**Venue:** Bahçeşehir Üniversitesi, İstanbul / Turkey  
Çırağan Caddesi, Osmanpaşa Mektebi Sokak, No: 4 - 6  
34353 Beşiktaş, ISTANBUL, TURKEY

**Web page:** <http://www.wcpe2012.org/>

*Continued from page 5*

One of the factors for resistance to change is the strength of the epistemological concepts of teachers about the nature of the science they teach, the alternative concepts about teaching and the way students learn, and the influence of these representations on teaching practices and teaching decisions.

Research has shown that conceptual, attitudinal and methodological changes among teachers only happen when they become conscious of their important role as transformative actors in their societies. It is highlights that much of what has already been learned through research hasn't percolated to most courses in higher education curricula, and this certainly makes future change more difficult to achieve.

### Science Popularization and Communication, Public Policy and Methodological Questions

Paralleling the growth of the field of Science Popularization and Communication, there is a growing concern, in the field of Physics Education Research, about how this popularization happens and what is the relationship between the non-formal education spaces and those of formal education at school. Researchers are also concerned about public policy in the different governments (federal, state and municipal governments). The development of students and their teachers while facing new official guidelines about materials and curricular structures are also being followed by researchers. There is also concern about proposals to raise the number of seats in courses for future teachers and, at the same time, the risk of abandonment for them after they graduate, since salaries for teachers in the different regions of the country vary greatly. Those studies lead us to believe that, without governmental commitment to invest in good working conditions, good salaries and physical

structure at schools, results of research on Physics Education will not contribute adequately to Physics teaching in Brazil.

### Recommendations

According to the studies carried out in the last years by the community involved in the physics education research, the SBF recommendations to the government and the society, as a whole, are basically:

- More investment in joint projects involving public universities and schools;
- Support for PER groups that work with continuing education for teachers;
- Scholarships for elementary school and high school teachers so they can participate in PER. It would be interesting to turn their classes into research laboratories, taking into account their observations and evaluations of didactic processes;
- Funding for producing didactic material for basic education based on results of research in the field;
- Incentives for PER groups to engage in collaboration with their counterparts abroad;
- PIBID (Institutional Program for Initiation to Teaching Scholarship) Project with financing for acquiring research data and results;
- Integration of research groups with future teachers that are still undergraduates, so that they graduate already conversant with the PER field.

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*\* Apology: The touristy photographs have no direct relevance to the article of course; but they are so beautiful it would be a pity not to include them when the chance occurred.. Ed.*

## ICPE – IUPAP International Commission on Physics Education International Union of Pure & Applied Physics

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