Forum on International Physics

The American Physical Society website: http://www.aps.org/units/fip

September 2010 Newsletter

Noemie Koller, Editor

IN THIS ISSUE

The View from the Chair

Noemie Koller

It is midyear and time for a report on the overall activities that FIP has been engaged in. This was the year when the APS "April" Meeting was held in Washington again, but in February! However, the APS staff managed the logistics superbly and all planned events ran very smoothly, even though we missed the blooming of the cherry trees. The cherry blossoms were replaced by a major snowfall which impeded the travel plans of many attendees!

The FIP Newsletter

There has been a change in the newsletter editorship as Professor Laszlo Baksay, who has managed the FIP Newsletter effectively over many years, has assumed new responsibilities as US representative to the UNESCO Basic Sciences Scientific Board. The members of FIP are enormously grateful to Laszlo for his many years of service and his important contribution to the FIP.

Dr. Ernie Malamud, retired from Fermi Lab, and currently on the Adjunct Faculty at the University of Nevada (Reno), was elected by the FIP Executive Committee, to a 3-year term as FIP Newsletter editor.

I spoke with Ernie and asked him what he would like to accomplish as the FIP Newsletter Editor. This was his response:

"The Newsletter is a crucial means for communicating with our large membership of over 3000. This is especially true since only a small percentage is able to attend the FIP sessions at the APS March and April meetings.

*As specified in the by-laws I will edit two newsletters per year, a fall issue and a spring issue. The first one I edit will be the Spring 2011 issue and my goal is to have it completed in time to have printed copies available at the APS March meeting March 21 - 25, 2011 in Dallas, Texas. Therefore, I've set the deadline for receipt of contributions for this issue as February 1, 2011. Members of the FIP are invited and encouraged to submit contributions. Send them to **malamud@foothill.net**.*

Also as specified in the by-laws I am appointing a small Newsletter Committee to help me with author and topic suggestions.

For contributions I prefer "newsy" items of 500 – 1000 words in length but article length is certainly negotiable! Also I like photographs and other graphic items. Preferred format is MSword and JPG for the illustrations. I look forward to hearing from you. Thanks, Ernie"

Executive Committee Meeting in Washington, Dc, February 2010

The 2010 Executive Committee meeting was held during the "April" meeting in Washington. Next year's meeting will likely be held during the March meeting, in Dallas, March 21 - 25, 2011. The next April meeting will take place in Anaheim, April 30 - May 3, 2011.

The Committee welcomed the newly elected members-at-large of the Executive Committee, Alberto Santoro of the Universidade do Estado do Rio de Janeiro, Brazil, Giulia Pancheri of the INFN Frascati National Laboratory, Rome, Italy, and the well known Past FIP Chair, Herman Winick, newly elected as APS/FIP councillor.

There were several guests attending the meeting and dinner: Luis Rodriguez, President of the Mexican Physical Society, Fernando Quevedo, the new Director of ICTP, and Ivelisse Cabrera, past International Students Affairs Officer and Sarah Caudill, Chair of the Forum of Graduate Students Affairs (FGSA).
Luis Rodriguez gave an overview of the activities of the Mexican Physical Society. Sarah Caudill gave an overview of the activities of FGSA and thanked FIP for reaching out to FGSA and recognizing the graduate student perspective.

Amy Flatten, the APS Director of the International Affairs Office discussed the importance of the international physics community to the APS and her remarks are summarized below.

(Continued on page 3)

(Continued from page 2)

General Thoughts for Future FIP Activities

The world is becoming more and more supportive of global collaborations. Traveling across oceans and continents is done as a matter of fact for experimental and theoretical work in spite of advanced communication systems. Our colleagues form an increasingly diverse group where the diversity is evidenced by the increased overlap of and interaction between fields and most important in the demographics, junior to senior scientists sharing the "work bench," senior professors sharing night shifts with students and postdocs, people with different nationalities and ethnic origins sharing in the joy of understanding our physical environment. At the same time national governments are recognizing these social trends and are increasingly supporting the demands that cross national boundaries. The American Physical Society Forum on International Physics is seeking input from its community in order to further ease the coordination of efforts and serve its constituents at home and abroad. We are thinking in terms of international meetings, easier travel, visa issues, support in the form of no longer equipment donations to developing countries schools and laboratories, increased membership,.... any idea can be helpful....call, write, be engaged.

Awards

At the November 2009 meeting of the APS Council eight FIP-sponsored Fellowship nominations were approved:

Farhad Ardalan, Sharif University of Technology,
Ching-Ray Chang, National Taiwan University,
Karsten V. Danzmann, Institut fur Gravitationsphysik,
Mamoru Fujiwara, Osaka University,
Xingao Gong, Fudan University,
Carlos R. Ordonez, University of Houston,
Kok-Khoo Phua, World Scientific Publishing Co.,
Jorg Zegenhagen, European Synchrotron Radiation Facility

We welcome and congratulate the new Fellows and are proud of their achievements in both science and issues of international cooperation. Certificates were delivered to the recipients that could attend either the March or the April meetings.

The Marshak Lectureship Award to recognize distinguished physicists from developed and developing countries was awarded to Dr. Sowwan Mukhles, Al Quds University for his important achievements in the development of scientific collaborations in the Middle East.

Harvey Newman congratulates Mukhles Sowwan who received the Marshak Lectureship Award for 2010.

FIP Sessions at the General Meetings and Call for Contributions

As usual our most important activity at the meeting was to run several invited papers sessions at the two general meetings, the Washington, DC meeting on February 13 - 16, 2010 (4 sessions), and the Portland, OR meeting on March 15 - 19, 2010 (2 sessions).

Brief overviews of the talks are given in this newsletter.

A **new** sorting category ***"P4: International Programs, Collaborations and Exchanges"*** was added to the program of the General Meetings in March and April where contributed abstracts dealing with international issues would be welcome.

Noemie Koller, Chair of the APS Forum on International Physics, is a Professor in the Rutgers University Department of Physics and Astronomy. Koller's specialty is Nuclear structure and Ion-Solid Interactions.

News from the APS Director of International Affairs

Amy Flatten

Greetings to the members of the Forum on International Physics.

I look forward to working with you to bring you news from the APS International Affairs Office, and to provide you with insights regarding the Society's new efforts in the international physics community.

Most APS members would agree that physics is "international" in nature, but, many may not have realized the large number of APS members that are based outside the United States—nearly 25% of our members (excluding students). Despite our large international membership, however, many of these colleagues have commented in membership surveys that they feel APS activities are "US-centric" and lack relevance to physicists in their region. According to these surveys, most of our international members do not travel to the U.S. for APS meetings, and do not participate in the "APS community" beyond reading journals and receiving Physics Today. Moreover, less than half (46%) of international respondents believed that APS meetings and programming reflect the interests of the international physics community, and overall, only 31% of respondents believed that APS provides international members with ample opportunity to comment upon APS priorities and activities. (1998 APS Non-US Resident Membership Survey) These same members, however, express eagerness to participate in APS more actively.

Collectively, the APS leaders, the Executive Board, and CISA believe this is a critical time to engage our international members, and several new developments should be of particular interest to FIP members:

Additional International Representation on Council

The APS Council has unanimously approved a recommendation for a Constitutional amendment to ensure that international perspectives are effectively represented in the Council, the Society's governing body. Briefly, the proposed changes to the Constitution will enable 4 of the 8 "General" Councillors to be designated as "International Councillors," who will serve 4-year terms. Additional details on the proposed changes are at http://www.aps.org/about/governance/election/index.cfm

International "Friends of APS" Program

The "Friends of APS" program, started in 2000, includes 159 participating U.S. institutions. "Friends" are APS members who have agreed to help facilitate communication with other members at their institution and/ or in their local community. While the Friends program has proven itself as a useful tool in communicating with APS members, it currently involves only APS members based in the United States. Expanding this program internationally will strengthen linkages with members and key institutions beyond U.S. borders. Within the next few months we will be contacting APS Fellows and FIP members in cities worldwide (initially starting with 50) for recommendations and/ or nominations for this program.

Support for Local Events Outside of United States

Once this network is established, APS will invite "International Friends" to submit proposals for a small amount of funds to hold an event at their institution, in their local community, or in conjunction with another local/regional physics meeting. These funds will enable international members to participate in APS events without traveling to the United States, and foster networking among members and collaborative events with other physics organizations. APS will provide additional details (i.e., requirements, fund limits, etc.) for this funding opportunity once the International Friends network is established.

I believe the above initiatives are a good beginning. The APS leadership is continuing to explore how the Society could expand its international engagement. I will not only keep you apprised of new developments, I will welcome your participation in these endeavors.

In the mean time, you may read more about the Society's initial efforts to better serve its international members in the January issue of *APS News*, http://www.aps.org/publications/apsnews/201001/backpage.cfm.

Dr. Amy Flatten is Director of International Affairs at the American Physical Society.

APS “April Meeting” in Washington, D.C., February 13-16, 2010

FIP sponsored or co-sponsored 4 sessions:

B4, FIP, Panel Discussion: Physics in Africa
J6, FIP and FGSA, Panel Discussion: Policy for Physics and Science in Developing Countries
Q3, FIP and DPF, Keys to Success in Global Collaborative Physics Projects
Y4, FIP and FED together with the AAPT, Panel Discussion: What Can We Learn from Physics Teachers in High Scoring Countries on the TIMSS and PISA International Assessments?

Following are summaries of these sessions.

Panel Discussion: Physics in Africa *Reported by Paul Gueye*

Sponsored by the FIP and the National Society of Black Physicists (NSBP)
Chairpersons: David Ernst (Vanderbilt University) and Paul Gueye (Hampton University)

The Physics in Africa session, was organized as a FIP sponsored panel discussion session on Saturday, February 13, 2010. The session format included three speakers followed by a panel discussion: Jean-Pierre Ezin (on "Science and Technology in Africa: The African Union Initiative and Financial Support Perspectives", Paul Gueye (on an "International Interdisciplinary Research Institute Project in Senegal") and Gordon McLeod (on "African Astronomy and the Square Kilometer Array"). Due to the weather conditions in Washington, DC, Jean-Pierre Ezin could not be present; in his place a short presentation was made by Charles McGruder (on the future of the African population and its international scientific impact using astronomy as an example).

Paul Gueye is a Research Professor with the Hampton University Physics Department at the Center for Advanced Medical Instrumentation and participates in experiments at the Thomas Jefferson National Accelerator Facility. He is a Member-at-Large of the FIP Executive Committee.

Policy for Physics and Science in Developing Countries
Reported by Paul Gueye

Sponsors: FIP, FGSA
Chairpersons: Paul Gueye (Hampton University) and Galileo Violini (Universita della Calabria)

The Policy for Physics and Science in Developing Countries session was organized as a FIP-FGSA sponsored panel discussion session on Sunday, February 14, 2010. The session format included six speakers: Carlos Aguirre-Bastos (on “**Policy for Research and Innovation in Latin America**"), Jean-Pierre Ezin (on "**Science and Technology in Africa**: **The African Union Initiative and Financial Support Perspectives**"), Mustafa El-Tayeb (on the "**Perspective from UNESCO**"), William Lawrence (on the "**Perspective from the US**"), Jose Hipolito Garcia-Garcia (on perspective from the Graduate Students) and Gustavo Atilio Crespi (on “**The Financial Support Perspective**”). However, due to the inclement weather conditions in Washington, DC, neither Carlos Aguirre-Bastos nor Jean-Pierre Ezin could be present. Galileo Violini presented on their behalf. Mustafa El-Tayeb was prevented from attending by a visa related issue and was also represented by Galileo Violini. William Lawrence was out of the country as part of US State Department related travel.

An Informal Closed Session Panel Discussion followed the two sessions and was held on Sunday with the intent of summarizing both sessions and identifying concrete steps to address some of the challenges to develop science and technologies in developing countries.

At that session there were twelve participants: Gustavo Crespi (Inter-American Development Bank), Chantale Damas (CUNY/The Graduate Center), Jose Hipolito Garcia-Gracia, (Tecnologico de Monterrey), Paul Gueye (Hampton University), Gordon MacLeod

(Continued on page 6)

(Continued from page 5)

(Department of Science and Technology), Charles McGruder (Western Kentucky University), Lawrence Norris (National Society of Black Physicists), Giulia Pancheri (INFN-Italy), Fernando Quevedo (ICTP), Leo Violini (Universita della Calabria), Annick Suzor-Weiner (Embassy of France to the US) and Bahram Zandi (guest participant). The discussion was centered on the following topics:

The Square Kilometer Array: ways to support Africa's bid were addressed and included the possibility of a FIP-initiated study that would consider the socio-economical impact of SKA in both Australia and South Africa (this unbiased study would hopefully benefit Africa's bid);

ICTP support to increase the number of astronomers in Africa: the Sandwich Training Educational Program (STEP) was suggested as one of many training schemes within ICTP for this initiative;

Haiti reconstruction: contribution from ICTP, TWAS, UNESCO and IDB was addressed to foster the inclusion of Science and Technology in the reconstruction of the country's infrastructure following the devastating 2009 earthquake. A trip to the island that included participation from two members of this informal session (Chantale Damas and Annick Suzor-Weiner) was held in May;

ICTP Science & Economic Research Group: consideration of creating/hosting an ICTP-initiated science/economic research group to foster collaboration between scientists and economists to stimulate economic growth through S&T in Africa and developing countries; African Economic Research Consortium: this entity provides advanced policy research and training in economics to the whole African continent. A close collaboration between ICTP and AERC could be initiated to create a science and economics research consortium for Africa;

Science and Economics Forum: the possibility of ICTP hosting a Davos World Economic style forum in science and economics in Africa to bring together scientists, engineers, economists, high level government officials, NGOs and businesses together to discuss science and economic policies for Africa; and

South-South cooperation: a cooperation between Latin America, Central America and Caribbean Universities on one end and Africa on the other to encourage cooperation between universities in these regions and leverage the language barrier between the two continents (for example: Mozambique, Brazil and Portugal are all Portuguese speaking countries).

Paul Gueye is a Research Professor with the Hampton University Physics Department at the Center for Advanced Medical Instrumentation and participates in experiments at the Thomas Jefferson National Accelerator Facility. He is a Member-at-Large of the FIP Executive Committee.

Keys to Success in Global Collaborative Physics Projects

Reported by Harvey Newman

Sponsor: FIP
Chairperson, Harvey Newman (CalTech)

This deeply informative session at the April 2010 meeting, co-sponsored with DPF, explored the key issues in science, technology and global collaboration that face some of the largest and most diverse experimental programs today, which are driving the leading edge of our fundamental knowledge. Steve Myers, Director of Accelerators and Technology at CERN, in a talk entitled "**The Large Hadron Collider**", spoke of the many technical and international collaborative challenges and accomplishments of the LHC project which defines the leading edge at the high energy frontier of particle physics, as well as the new plans of CERN to broaden global participation.

Samuel C. C. Ting (MIT; Nobel Prize 1976) described "**The Alpha Magnetic Spectrometer (AMS) on the International Space Station**", a truly groundbreaking project in science and international collaboration jointly sponsored by NASA and DOE. This project will measure the production of electrons and ions as well as their antimatter counterparts during its planned 20 year stay on the International Space Station, and may shed new light on the exciting indication of a positron excess in cosmic rays reported elsewhere at the meeting. Ting also gave a perspective on his career in physics, where each project has been at the leading edge of in-

(Continued on page 7)

ternational collaboration.

Finally, the Marshak Lectureship award winner Mukhles Sowwan (Al-Quds University, Palestinian Authority) gave a wide ranging talk on "**SESAME, An International Collaborative Science Project in the Middle East**". The SESAME synchrotron radiation facility is a unique multidisciplinary center in Jordan which brings together several hundred scientists from the regions well as other parts of the world, and covers investigations ranging from archaeology to biomedicine to condensed matter and atomic and molecular physics to nanotechnology. The unprecedented success of SESAME in bringing together scientists from Bahrain, Cyprus, Egypt, Iran, Israel, Palestinian Authority, Jordan, Pakistan and Turkey to work together in harmony in spite of the politically volatile environment in the region, with the encouragement and help of leading scientists from Europe and the U.S., was a highlight of the session.

Harvey Newman is a Professor at CalTech, a high-energy physics experimentalist and Chair-Elect of the FIP. In that role he is the FIP Program Chair and is currently organizing the sessions for the APS Spring 2011 meetings.

Panel Discussion: What can we learn from physics teachers in high-scoring countries on the TIMSS and PISA international assessments? *Reported by Cherrill Spencer*

Sponsor: FIP, FEd
Chairperson, Cherrill Spencer (Stanford)

What can we learn from physics teachers in high scoring countries on the TIMSS and PISA international assessments? Report on an invited session at the 2010 "April" APS meeting held in Washington DC on 16th February, 2010. The session was organized and chaired by Dr Cherrill Spencer, a member-at-large of the Executive Committee of the Forum on International Physics, who has written this detailed summary for the FIP newsletter so that more people than the 30 who attended the session can learn about this topic. This session was co-sponsored by FIP and the Forum on Education.

The Session was of high interest to many in the FIP community and a very extensive description of the talks and discussion is presented on page 13 as a SPECIAL FEATURE.

Cherrill Spencer is a Member-at-Large of the FIP Executive Committee, and is a Mechanical Engineer at the SLAC National Accelerator Center at Stanford University.

L to R. Pekka Hirvonen (Finland), Jozefina Turlo (Poland), Cherrill Spencer (SLAC) and Lei Bao (Ohio State University).

APS March Meeting in Portland Oregon, March 15-19, 2010

FIP sponsored or cosponsored two sessions:

B8, FIP, Four Horsemen of the Apocalypse Redux: The Physics of Global Catastrophes and Global Countermeasures
T8, FIP and FGSA, Panel Discussion: Emerging Scientific Powers in the East: China

These sessions are summarized below.

Social Events

The FIP hosted a RECEPTION on March 16, 2010 which was co-sponsored by OCPA (Overseas Chinese Physics Association), ACIPA (American Chapter of Indian Physics Association), IrAP, Iranian American Physicists Network Group, AKPA (Association of Korean Physicists in America), and the APS Office of International Affairs. There was time for ample discussion and learning about each other’s interests. "Ex pats" from Iran, Turkey, Taiwan attended the reception as well.

The Taiwan Physical Society hosted a reception for its members, Chinese background physicists, interested western physicists and their guests on March 17, 2010.

Four Horsemen of the Apocalypse Redux: The Physics of Global Catastrophes and Global Countermeasures *Reported by John Clark*

Sponsor: FIP
Chairperson, John Clark, Washington Univ., St. Louis

In the last book of the New Testament, Four sinister and mysterious Horsemen appear whose presence signals apocalypse and whose characters are widely interpreted as allegories for catastrophes befalling humanity at the End of Time: war, famine, pestilence, and death.

These ancient themes were revisited from the modern perspective of network analysis by a panel of distinguished scientists at the 2010 March meeting in an FIP-sponsored invited session: The Four Horsemen of the Apocalypse Redux: The Physics of Global Catastrophes and Global Countermeasures. Nothing could be more international than the end of the world, or than international scientific cooperation toward averting this fate in its multifarious forms. Physicists, obsessively curious by nature, are not immune to fascination with end-of-the-world scenarios. But since they are just as obsessive problem-solvers, they can be easily stimulated to think of ways of avoiding or mitigating apocalyptic events. Moreover, globalization in the ubiquitous formation of worldwide networks of all kinds is on everyone's mind these days. The more complex a network (made of nodes and causative links or connections between the nodes), the more ways there are for things to go wrong. Adding more and more connections between nodes tends to move a network into an unstable dynamical regime, leading for example into chaos. Complex systems generally have nonlinear behavior, implying that small causes can lead to large and unexpected consequences. By extension, globalization of political, economic, and social systems is fraught with unintended consequences. Advances in the statistical physics and dynamics of such complex global networks can sometimes give us fair warning of disasters that may befall us before they become inevitable.

In organizing the Apocalypse session, four modern counterparts of the biblical horsemen were identified, representing global pandemics, modern warfare (international terrorism/nuclear holocaust), environmental doom, and world-wide economic collapse. Each of these "renormalized horsemen” was addressed by a speaker with unique expertise and high visibility. John Clark (FIP Past Chair) chaired the session. Mark Newman (University of Michigan), a world leader in the field of complex networks, was invited to lead off with a general overview of network properties that engender vulnerability or instead foster resilience (failure versus robustness): "**Failure and robustness in networks**"; Alessandro Vespignani (Indiana University)

(Continued on page 9)

(Continued from page 8)
explained how physics, network analysis, and computing can help fight off global pandemics, Kathleen Carley (Carnegie Mellon) reviewed progress in developing network science for deterrence of the terrorism/nuclear horseman: "**Forecasting techno-social systems: how physics and computing help to fight off global pandemics**"; Jonathan Katz (Washington University) explored realistic geoengineering scenarios for dispersing aerosols in the stratosphere to induce global cooling: "**Global Response to Global Warming: Geoengineering with Stratospheric Aerosols**"; and H. Eugene Stanley (Boston University) described remarkable advances in quantifying extremely rare events through application of statistical physics to large bodies of data on economic fluctuations: "**Economic Fluctuations and Statistical Physics: Quantifying Extremely Rare Events with Applications to the Present Worldwide Crisis**".

The session was very well received, with attendance running in the range 200-300 and lively discussions generated by each talk. The session was one of those selected by APS for a press conference, in which the chair and speakers gave brief presentations and answered questions from representatives of the science news media. Subsequently, an article reporting on the session, "**Big or Small, Financial Bubbles Burst Alike**", by Laura Sanders, appeared Science News, April 10, 2010, Vol. 177, \#8, p. 11 (link: http://www.sciencenews.org/view/generic/id/57369). This article highlights the discovery, by Gene Stanley and his co-workers, of the striking empirical scaling law that governs financial bubbles.

John Clark is Past-Chair of the FIP. He is Wayman Crow Professor of Physics and Chair in the Department of Physics at Washington University. His research interests are the Quantum Mechanics of Many-particle Systems, Dense-matter Astrophysics, Neural Network and Computational Neuroscience, and Quantum Control.

Panel Discussion: Emerging Scientific Powers in the East : China

Reported by Noemie Koller

Sponsors: FIP and FGSA
Chairperson, N. Koller, Rutgers University

The last few years have seen an enormous surge in scientific development in China, India and South East Asia countries as evidenced by significant growth in basic science research, the strengthening of institutions of higher learning, the development and innovation in their technical infrastructure, the increase in international collaborations, as well as changes in the demographics. This session focused mainly on China while future events will consider the role of science and education in India, Pakistan, Bangladesh, Malaysia, and will report as well on the status of research in Australia and New Zealand.

Three aspects of the issues were selected for discussion related to the science being carried out and the scientists of all ages who are at the forefront of the developments in China, Taiwan and the United States.

J. Raynien Kwo, President of the Physical Society of Taiwan and Professor in the Department of Physics National Tsing Hua University presented the "**Progress and Prospects of Physics Research and Education in Taiwan**". She emphasized that the remarkable progress in physics research and education in Taiwan was supported by a steady governmental commitment at the level of 2.62% of the GDP as well as by the vital Taiwan high tech industry. The scope of these investigations encompasses high energy and astrophysics, nano and condensed matter, semiconductor and optoelectronic physics. International collaborations with the LHC, KEK, ALMA and Pan-STARRS groups have flourished. The early trend of outflows of BS physics majors to the western world for advanced studies has reversed dramatically as there are now lucrative jobs available in Taiwan. In addition, there is a healthy inflow of high quality science manpower of well trained PhDs and senior scholars returning to the homeland. Concerted efforts for scientific exchanges are being taken to connect to international societies. The bright outlook of physical science in Taiwan is anticipated to have far-reaching impacts on South East Asia, China and worldwide.

Professor E. G. (Enge) Wang is the General Secretary of the Chinese Academy of Sciences, Director of the Beijing National Laboratory for Condensed Matter Physics and a Professor at Peking University. He talked about "**Physics in China: the Past and Next Dec-**

(Continued on page 10)

(Continued from page 9)

ade". Professor Wang assessed the status and future direction of research and education in the natural sciences disciplines in China resulting from the unprecedented changes in pace and stability of economical developments over the last decade. He described his own theoretical work on surface physics and the discoveries made in his laboratory at Peking University, and gave an overview of condensed matter research in other institutions in China.

Professor Zhi-Xun Shen from Stanford University presented a cultural and historical perspective of the development of Physics research and education in China, "**Education exchange and impact to Chinese Physics**". The first Chinese student sent to the US, Mr. Hong Rong (Yung Wing) received a Bachelor's degree from Yale in 1854. Even though education carries an enormous weight in Chinese society Chinese students had to complete their scientific training abroad. No PhD had been awarded in China before 1981. In 1980 Professor T. D. Lee convinced the authorities to initiate the now famous CUSPEA (China-US Physics Examinations & Applications Program). Chinese students who passed a special examination were invited to come to the best US universities to continue their studies. In a decade 915 students were admitted.

Many of these students stayed in the US where they contributed to significant advances in many areas of physics. But the CUSPEA alumni contributed to reconnect the Chinese Physics community and the world community, and now are returning to China where they are contributing to science and science management, commercial enterprises or investment businesses. China has gone through one of the most dramatic social transformations in human history and now is poised to interact with the rest of the world. This growing physics community is faced with new national and international responsibilities and challenges. International cooperation is growing and new collaborations will accelerate the process.

And finally we heard the views of the young generation of students, Mr. Yang Yang from Duke University who described how "**Students made in China contribute to the world**", or, paraphrasing, "From Nanjing to Durham". Mr. Yang belongs to the generation that followed the CUSPEA program. He earned a BS in theoretical physics at the University of Nanjing under the new educational system developed in China. In his talk he also described the historical background of the importance of education in the Chinese family and the great efforts made by those that could make it to the US or Europe to pursue graduate education. But he moved on to describe how the system works today, the extensive courses necessary to obtain a degree in the Chinese system, the difficulties of learning English, the cultural differences brought about by the American dream and American apple pie, the separation from family (Confucius said that one shouldn't travel too far away when one's parents stay at home), the visa requirements, the fear of returning home for a family visit without guarantee that the visa will be extended, the costs of living abroad. He then posed the big question, "Are we going back? Which was answered with a no by the previous generations but is increasingly regarded as a real possibility by the younger generations who do find employment in China. The globalization of the world is also a factor as American Universities are opening campuses in the East. The regular talks were followed by a lively discussion with the audience.

Mr. Yang Yang, graduate student at Duke University, and Prof. Enge Wang, Director of the Peking National Laboratory for Condensed Matter Physics, who spoke at the session on Emerging

Noemie Koller, Chair of the APS Forum on International Physics, is a Professor in the Rutgers University Department of Physics and Astronomy. Koller's specialty is Nuclear structure and Ion-Solid Interactions.

TRAVEL

Michele Irwin

India – U.S. Travel Program

The Indo-U.S. Science and Technology Forum (IUSSTF) and the American Physical Society (APS) co-sponsor an exchange program for physicists and physics graduate students between India and the United States. The Professorship Awards in Physics funds physicists in India or the United States wishing to visit overseas to teach short courses or provide a physics lecture series delivered at a U.S. or Indian university. Through the Physics Student Visitation Program, U.S. and Indian graduate students apply for travel funds attend a short-course or summer institute, work temporarily in a laboratory, or pursue another opportunity that the student and the host professor believe is worthy of support. The Physics Student Visitation Program aims to mostly support graduate student travel to India by U.S. citizens, while enabling some students of Indian citizenship to travel to the United States.

India-US Physics Students Visitation Program

In the spring 2010 six students benefited from the Program:

Akaa D. Ayangeakaa, Department of Physics, University of Notre Dame.

In the fall of 2010, Mr. Ayangeakaa will participate in experiments on the study of nuclear tidal waves using the Doppler Shift Attenuation Method (DSAM) at the Indian National Gamma-ray Array (INGA) at the Tata Institute for Fundamental Research (TIFR) in Mumbai.

Aatish Bhatia, Department of Physics and Astronomy, Rutgers University.

Mr. Bhatia will visit TIFR in Mumbai from 1 January to 31 March 31 2011. During that time, he will assist his thesis advisor, Professor Gyan Bhanot, in teaching a course in Biophysics and Bioinformatics in the Department of Theoretical Physics at TIFR. He will also conduct research with members of the Department of Theoretical Physics and Biological Sciences.

Amitai Bin-Nun, Department of Physics and Astronomy, University of Pennsylvania.

Mr. Bin-Nun will visit the Inter-University Centre for Astronomy and Astrophysics (IUCAA) in Pune for a few weeks in the fall of 2010. During that time he will conduct research on the topic of gravitational lensing and braneworlds with his host Professor N. Dadhich.

Debraj Choudhury, Department of Physics, Indian Institute of Science, Bangalore.

Mr. Choudhury will participate in the experiments at the Advanced Photon Source at Argonne National Laboratory in Illinois with his host Dr. John Freeland in the Magnetic Materials Group.

Chris Coleman-Smith, Department of Physics, Duke University.

Mr. Coleman-Smith will collaborate with Dr. Dinesh K. Srivastava at the Variable Energy Cyclotron Center in Kolkata. He will also attend and present a poster at the 10th International Conference on the Physics and Astrophysics of the Quark-Gluon-Plasma, to be held in Goa, 5 to 10 December 2010.

James Matta, Department of Physics, University of Notre Dame

In the fall of 2010, Mr. Matta (like Mr. Ayangeakaa) will participate in experiments on the study of nuclear tidal waves using the Doppler Shift Attenuation Method (DSAM) at the Indian National Gamma-ray Array (INGA) at TIFR in Mumbai.

The India-U.S. Professorship Awards in Physics were awarded to three Professors:

Dr. Irudayaraj Johnson, Department of Physics, St. Joseph's College, Trichy

Dr. Johnson will present a series of lectures on the effects and applications of ultrasound in nanomaterials, nano thin films, and nondestructive evaluation at the Department of Physics at Utah State University in Logan.

Professor Humphrey J. Maris, Brown University, Providence, Rhode Island

Professor Maris will visit the Department of Physics at the Indian Institute of Science in Bangalore in January 2011 where he will give a short course of lectures on

(Continued on page 12)

(Continued from page 11)
his current research, including supersolid helium, electrons in liquid helium, physics of nucleation and ultrahigh frequency ultrasonics.

Professor Richard Packard, Physics Department, University of California, Berkeley

In November 2010, Professor Packard will deliver lectures describing his group's research on superfluid weak links at the Tata Institute for Fundamental Research in Mumbai, The University of Hyderabad, and the India Institute of Science, Bangalore.

The International Travel Grant Program (ITGAP)

The International Travel Grant Award Program (ITGAP) was established to promote international scientific collaborations between APS members and physicists in developing countries. Grant recipients receive up to US $2,000 for travel and lodging expenses for international travel while visiting a collaborator for at least one month. Members of APS units that sponsor ITGAP* are eligible to apply.

For the eleventh cycle of the program (Winter 2010) the APS received nineteen proposals from thirteen different countries. The following three collaborative teams were awarded grants. We congratulate the recipients and wish them a most successful collaboration with long term benefits.

1. Dr. Martin Nieto-Perez (Member of DPP)
   Instituto Politecnico Nacional (IPN)
   Mexico D.F., México

   Dr. Richard Majeski (Member of DPP)
   Princeton Plasma Physics Laboratory (PPPL)

Dr. Nieto-Perez will visit PPPL from mid-July to mid-August 2010 to use the liquid lithium test stand available at PPPL to study two particular aspects of the lithium film.

2. Prof. Irina Novikova (Member of DAMOP & FIP)
   Department of Physics
   College of William & Mary

   Prof. Arturo Lezama (Member of DAMOP & FIP)
   Instituto de Fisica, Facultad de Ingeniería
   Universidad de la República, Montevideo, Uruguay

Prof. Arturo Lezama will visit to the College of William & Mary this year to participate in a joint experiment in the generation of light with non-classical statistics (in particular squeezed vacuum) using atomic coherence.

3. Dr. J. Y. Vaishnav (Member of DAMOP)
   Department of Physics
   Bucknell University, Lewisburg, Pennsylvania

   Dr. Gediminas Juzeliunas
   Institute of Theoretical Physics and Astronomy
   Vilnius University, Vilnius, Lithuania

Dr. Juzeliunas will travel to the U.S. where he will collaborate with Dr. Vaishnan at the National Institute of Standards and Technology (NIST) Gaithersburg, MD. They will conduct a theoretical exploration of artificial magnetic fields for atoms with the goal being to propose "atomtronic" devices which could extend the capabilities of electronic ones.

* As of February 2010, ITGAP is sponsored by the following APS units: the Division of Astrophysics (DAP); the Division of Atomic, Molecular and Optical Physics (DAMOP); the Division of Computational Physics (DCOMP); the ¨Division of Materials Physics (DMP); the Division of Nuclear Physics (DNP); the Division of Particles and Fields (DPF);¨the Division of Physics of Beams (DPB); the Division of Plasma Physics (DPP); the Division of Polymer Physics (DPOLY); the Forum on International Physics (FIP); theTopical Group on Magnetism and its Applications (GMAG).

Michele Irwin is the APS International Programs Administrator.

What can we learn from physics teachers in high scoring countries on the TIMSS and PISA international assessments?

Cherrill Spencer reports here on the Invited Panel Discussion and Session sponsored by FIP and FEd in Washington, February 16, 2010.

The session was organized and chaired by Dr. Cherrill Spencer, a member-at-large of the Executive Committee of the Forum on International Physics, who has written this detailed summary for the FIP newsletter so that more people than the 30 who attended the session can learn about this topic. This session was co-sponsored by FIP and the Forum on Education.

The slides of the three speakers are posted.

- Turlo:http://www.aps.org/units/fip/meetings/upload/turlo10.pdf
- Bao: http://www.aps.org/units/fip/meetings/upload/bao10.pdf
- Hirvonen: http://www.aps.org/units/fip/meetings/upload/hirvonen10.pdf

I recommend you look at the slides in conjunction with reading this summary.

Introduction by Dr. Cherrill Spencer

High-school teachers are amongst the most important contributors to the development of the science and technology workforce of the future. Many of the more than 23,000 US high-school physics teachers are not adequately prepared to teach the subject. Only one-third of them, for example, majored in physics or physics education. Can inadequate teacher preparation be a factor in the poor performance of US students on international assessments of their achievements in science and physics? Since 1995 the Trends in International Mathematics and Science Study (TIMSS) has been administered four times to many hundreds of thousands of students in over 60 countries. TIMSS is used to measure trends in the mathematics and science knowledge and skills of fourth- and eighth-graders. The Program for International Student Assessment (PISA) has been administered three times since 2000, it focuses on 15-year-olds' capabilities in reading literacy, mathematics literacy, and science literacy. TIMSS Advanced (1995) assessed school-leaving students who have had special preparation in advanced mathematics and physics. In all these studies the US students, including the Advanced Placement physics students, scored below the international average, sometimes in the bottom third of countries!

Three knowledgeable speakers were invited to talk about the physics K-12 education systems in other countries: one that consistently scores at the top of the PISA (Dr. Pekka Hirvonen, Finland) or score much higher than the US on TIMSS (Dr. Jozefina Turlo, Poland, covering various Central European countries) and significantly better on recent bi-lateral comparisons (Dr. Lei Bao, covering China in comparison to the US). This session was designed to find out what we can learn from the physics teaching systems in these high-scoring countries that might be pertinent to our efforts to improve the teaching of physics and science to 8th through 12th graders in the US.

There are several differences in the design and purpose of the TIMSS and PISA assessments; for example the TIMSS focuses on the application of familiar skills and knowledge often emphasized in classrooms, whereas the PISA tests emphasize students' abilities to apply skills and information learned in school to solve problems or make decisions they may face at work. PISA test questions tend to deemphasize factual recall and demand more complex reasoning and problem-solving skills than those on TIMSS, requiring students to apply logic, synthesize information, and communicate solutions clearly.

"Physics teacher education in Finland and reasons underlying the top scores of Finnish students in international assessments."

This was the title of Dr. Pekka Hirvonen's presentation. He is the head of the Education Unit in the Department of Physics and Mathematics at the University of Eastern Finland. He is Vice President of the Finnish mathematics and science education research association and board member of the Finnish graduate school of mathematics, physics, and chemistry education. Finnish 15 year olds, a nationally representative sample, scored the highest on the science PISA in both 2000 and 2006. In 2006 they scored 563 points (on a 0-1000 scale), the second highest was Hong Kong with 542, and the US

(Continued on page 14)

(Continued from page 13)

was the 16th country with 489 points.

Dr. Hirvonen said that many people have tried to explain the good results of the Finnish children; the Finnish policymakers claim they have made wise decisions and that is the reason, on the other hand, teacher educators say they are educating such good teachers, while the teachers say they are teaching so well. Probably they are all partially right. His favorite explanation is that education is highly appreciated in Finland. Since the Second World War the Finnish society has developed quickly from an agricultural country to a high-tech and education-oriented country and this development has been brought about through an improved education system; a good education in Finland has always been a way to achieve a job in their society, no matter their family's background.

Furthermore, because the Finnish population is quite homogeneous it is easy to teach the children the basic skills quickly. He contrasted this with classes (such as we have in US schools) with children from 10 different countries who are trying to learn to read and write English first; this is a difficult environment for the teacher. Another typical feature of the Finnish school system is that it is organized so that even the weakest children learn basic skills; this system may not be best for the smartest children.

Dr. Hirvonen talked about the influences on teacher education in Finland. Their physics teachers are trained in universities and each university has much freedom in deciding the content of their teacher education program. These programs cover both the acquisition of physics knowledge and learning how to teach (pedagogy). The structure of their teacher training has been influenced by how it is done in other European countries, but they have some unique aspects too. One is that there is a school within the university where the student teachers teach real children well before they get their degrees; this is an expensive strategy but it produces good teachers. The pedagogical studies and training school are organized by the faculties of education. The Finnish national school curriculum is not completely defined, its aims and content are given in a general sense and the teachers are trusted to be competent enough to make good decisions, so the teacher education is taken seriously.

Dr Hirvonen described the physics teacher education program at his university. Student teachers can apply to the teacher education program straight out of high school; they must have good final's scores and pass a suitability test that consists of an interview and a group session. During the first three years the prospective teachers learn just the same physics as the prospective physicists; in addition there are two laboratory courses just for the student teachers. One is basic laboratory practise for teachers; they work in groups of 3 and carry out well-defined hands-on activities. A tutor talks to them during the labs about taking observations and the concepts, and afterwards all topics are discussed in interactive lectures. The second special course is called laboratory practise for physics teachers; their responsibility is much bigger. They have 9 hours of lab time to create a teaching sequence lasting about one hour, with a clear learning goal. Then everyone's sequence is tried out with the other students working as a school-student.

At the beginning of their second year the student teachers begin their pedagogical studies in the department of applied education and start student teaching in the university training school. To become a licensed physics teacher in Finland one must have taken a Master's degree, i.e. two more years of study beyond the bachelor's degree. There are special courses for student teachers during their 4th and 5th years, some involve repetition of basic physics concepts to ensure they have a profound understanding of physics and some concentrate on students' pre-knowledge and learning problems. Other courses give them historical, philosophical or structural perspectives on physics; they see that it is not an isolated domain of knowledge. The Finnish idea is that teacher students should get a multi-dimensional picture about physics. It is not only learning formulas and doing problem solving but much more. They should be prepared to know what to teach, why to teach and how to teach in many different circumstances.

Dr. Hirvonen's final points were that their graduating teachers are still just beginners; they have been given a driving license and with much practice they will develop into skillful drivers. The co-operation between the three partners: subject department, department of applied education and university training school, is crucial to the success of the teachers they produce; they have a common goal - a good physics teacher.

More information about physics and teacher education research that is carried out in Dr Hirvonen's university can be found here: http://www.uef.fi/fysmat/fysiikan-opetuksen-tutkimus (in English) and he can be reached

(Continued on page 15)

(Continued from page 14)
at this e-mail address: pekka.e.hirvonen@uef.fi

"Teaching to Learn and Learning to Teach"

Our second invited speaker was Dr. Lei Bao, associate professor in the Physics Department at Ohio State University. He was educated through his undergraduate degree in China and obtained his Ph.D in Physics at the University of Maryland in 1999. His current research focusses on the large-scale quantitative assessment of learning in science and scientific reasoning in the international context. He is chair of the International Education Committee of the AAPT and holds guest professorships at 3 Chinese universities. His presentation was titled: "Teaching to Learn and Learning to Teach".

Dr. Bao noted that the TIMSS and PISA assessments offered a global view of K-12 science education and their data enables comparisons of education systems in different countries. Researchers such as he make the comparisons not in a competitive sense, but to learn about various systems. To experimentally prove that some way of teaching caused some better scores than another would need a totally randomized test (like a double blind experiment in medicine) and running such tests in real education settings is very difficult. Nevertheless, Dr. Bao is part of a physics education research community that is developing new research methodology and running comparison studies of Chinese and US physics high school and college students.

Dr. Bao observed that the competition to get into a Chinese university is fierce and he showed some math questions on the Chinese university entrance test for prospective science undergraduates. Everyone in the room gasped at the difficulty of the questions; then he showed some physics questions on the same entrance exam and we gasped again, especially as there were about 20 such difficult questions to be answered in two hours. The Chinese physics undergraduate must be able to really understand physics concepts and so their high school teachers must be able to teach them these concepts. High school teachers are trained in so-called "Normal" universities; it is their dedicated goal to produce teachers. Dr. Bao showed lists of mandatory and elective courses in the physics department at Huazhong Normal University, one can see the similarity to a US BS in physics in the mandatory courses (65 credits), and on top of those the physics teachers in training have to do 16 credits of professional education courses and 24 credits of elective courses:

The required courses in the physics department of Huazhong Normal University are listed as following.

Mandatory courses: Advanced Mathematics A(1,2), Linear Algebra A, Mechanics, Thermodynamics and molecular physics, Optical, Static Electricity and magnetism, Analytical mechanics, Methods of mathematical physics, Atomic Physics, Electrodynamics, Quantum Mechanics, Statistical physics, Analog Electronics; Physics Experiments Level 1, 2, 3. Analog Electronic Experiments. Credits for these courses total 65: 16-credits of professional education courses such as introductory education, psychology, teaching in physics, physics teaching skills, and modern educational technology.

Elective courses: 24 credits including advanced physics courses, professional education courses, teaching practice, and graduation design.

But the Chinese Science, Technology, Engineering and Math (STEM) education system over-emphasizes the learning of content to the detriment of learning how to solve real world problems, so their graduates do not have good problem solving skills. Another concern in China is that the STEM students lose interest once they arrive at the university; they have had to work so hard for many years to get into university and while they are there they do not try to do well anymore. The main concerns about science and engineering education in the US is that the students are, on average, below the expected performance level (as shown in the TIMSS) and there is a widespread "fear" of science and mathematics. Dr Bao noted that in both countries physics teachers are "teaching to the test" and this is not the best way for students to learn.

Both countries are engaged in STEM education reform and they have common goals: to balance the STEM content learning with the development of problem solving abilities, so that the new generation has the right mix of knowledge, skills and attitudes so that they become not only effective problem solvers but also good "problem creators". In Dr. Bao's opinion, currently both countries seem to be moving towards each other. The best solution is probably midway.

What are Physics Education Researchers (PER) doing to understand science education and science teacher preparation so that they can move forward the reform? Dr. Bao described how, currently in PER, we often emphasize research on the study of specific student diffi-

(Continued on page 16)

(Continued from page 15)

culties in various contexts and on the development of new instructions. There hasn't been much research on developing a consistent theory and methodology that can be used to model student's conceptual learning and to provide guidance for developing effective assessment technologies and instruments. Research is often conducted without the benefit of a strong theoretical foundation. Therefore, it is urgent to develop a coherent theory for research in physics education. Without a unified theory, different researchers don't have a common language to talk about their research work. In order to make physics education a strong field in physics, it is important to integrate different pieces of research together under a consistent research framework. Such a theory doesn't exist in education research. Dr. Bao said physics education researchers need to develop a theory for physicists with appropriate mathematical tools.

Dr. Bao is studying how students acquire scientific reasoning skills and whether the amount of STEM content knowledge they are learning has any effect on their domain-general skills, such as the abilities to systematically explore a problem, formulate and test hypotheses, manipulate and isolate variables, and observe and evaluate the consequences. He is using well-known physics concepts' tests and a scientific reasoning test as his measures and the variables are the K-12 science education systems in China and the USA, represented by thousands of Chinese 1st year college students (have taken 5~6 years of physics courses, mandatory, at complex level) and thousands of US 1st year college students (have taken 1~2 semesters' of physics, elective, at basic level).

To test their content knowledge the students all took (in their own language) the same FCI – force concept inventory test (mechanics, 30 questions, multiple choice) and same BEMA – brief electronic and magnetism assessment (E&M, 31 Questions, multiple choice). To test their scientific reasoning they all took a "Lawson" test with 24 multiple choice questions which tested abilities such as proportional reasoning, probabilistic reasoning and hypothesis deductive reasoning. Dr. Bao showed the three test scores of the Chinese and the US students graphically. In the FCI the highest percentage of the Chinese students scored 28 correct answers and the highest percentage of the US students scored 12 correct answers; in the BEMA most of the Chinese students scored 22 correct answers, the US: 9 correct answers. So the Chinese students obviously knew/understood a lot more physics concepts than the US students. But the shape of their scores' histograms on the scientific reasoning test were statistically the same, leading to the same mean score of 17.9 correct answers out of 24.

So the conclusion of this series of tests is that under current education settings the learning of content knowledge doesn't seem to have an obvious effect on the development of general scientific reasoning abilities. But what methods are effective in developing scientific reasoning abilities? Dr. Bao's PER group did some further experiments: they administered the Lawson test twice and in between they taught some students some regular introductory physics courses, their scores did not change on the 2nd Lawson test. Another group of students took some inquiry-based physics courses between the 2 Lawson tests and their 2nd test scores were significantly better. So Dr. Bao reported "*It is not what we teach but* ***how*** *we teach that matters!"*

Dr. Bao's team continues its research into how best to teach physics and they are evaluating the effectiveness of several education programs and developing a large scale national and international quantitative assessment database. They collaborate with researchers in 8 other countries and their work is reported in this journal: "*Research in Education Assessment and Learning*". http://www.iperc.org/REAL.

"Are the Competencies of Science Teachers and the Scientific Literacy of Society Essential for the Success of Physics Students?"

Our third invited speaker was Dr. Jozefina Turlo who was the head of the Physics Education Laboratory at the Institute of Physics, the Nicolaus Copernicus University, Toruń, Poland for 26 years. She graduated as a Ph.D in Physics from the same university and has been employed there since then as a researcher in solid state physics and in physics education. She is a member of the International Research Group on Physics Teaching-GIREP. She is the Polish Ministry of Education's referee on Teacher Training, Physics Textbooks and Educational Aids. Dr Turlo is Vice-President of the Polish Association of Science Teachers, partner in many European Union (EU) education projects and independent expert of a European Commission on Framework Project #7: "Science in Society". Her presentation was titled: "Are the Competencies of Science Teachers and the Scientific Literacy of Society Essential for the Suc-

(Continued on page 17)

(Continued from page 16)
cess of Physics Students?"

Dr. Turlo reminded us what are the main features of our time: globalisation, economic development based on knowledge, social transformations and dramatically accelerating progress in new technologies [such as new communication methods based on a merging of information and communications technologies: ICT] which is leading to many new jobs. She described what these features imply for science education: that science must now be learnt by all, not just some, affecting the curricula and aiming for general scientific literacy; that science education must teach how to be innovative, best taught through inquiry teaching methods; and that the competency of science teachers and their enthusiasm affect the overall success of science education.

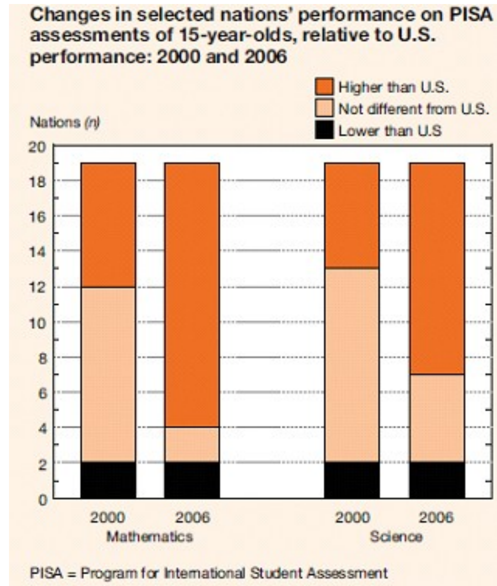
How does the science education community measure success, such that different countries can compare their education systems with others? There are several international studies that compare students in different countries and Dr. Turlo described the more important ones and their recent results.

Trends in International Mathematics and Science Study (TIMSS)

TIMSS is a series of assessments designed for fourth and eighth grade students to address concerns about the quantity, quality, and content of instruction. It is designed to identify progress or decline in student achievements. 50 countries from all over the world participated in the years 1995 – 2007. The best results were usually achieved by Singapore, Taiwan, Korea, Estonia, Japan, Hungary and the Netherlands (China has never participated in TIMSS).

Programme for International Student Assessment (PISA)

The PISA tests emphasize students' abilities to apply skills and information learned in school to solve problems or make decisions they may face at work, i.e. it measures their scientific literacy. Finland, with an average of 563 score points, was the highest performing country on the PISA 2006 science scale (as addressed by our first speaker, Dr. Hirvonen). Six other high-scoring countries had mean scores of 530 to 542 points: Canada, Japan, New Zealand, Hong Kong-China, Taiwan and Estonia. Australia, the Netherlands, Korea, Germany, the United Kingdom, the Czech Republic, Switzerland, Austria, Belgium, Ireland, Liechtenstein, Slovenia and Macao-China also scored above the OECD [Organization for Economic Co-operation and Development] average of 500 score points.



On average across OECD countries, 1.3% of 15-year-olds reached Level 6 of the PISA 2006 science scale, the highest proficiency level. These students could consistently identify, explain and apply scientific knowledge, and knowledge about science, in a variety of complex life situations. The number of students at Level 6 cannot be reliably predicted from a country's overall performance. Korea was among the highest-performing countries on the PISA science scale, with an average of 522 score points, while the United States performed below the OECD average, with a score of 489. Nevertheless, the United States and Korea had similar percentages of students at Level 6.

The number of students at very low proficiency is also an important indicator in terms of citizens' ability to participate fully in society and in the labour market. At Level 2, students start to demonstrate the science competencies that will enable them to participate actively in life situations related to science and technology. Across the OECD, on average 19.2% were classified as below Level 2, including 5.2% below Level 1. Males and females showed no difference in average science performance in the majority of countries, including 22 of the 30 OECD countries. However, similarities in average performance mask certain gender differences: In

(Continued on page 18)

(Continued from page 17)

most countries, females were stronger in *identifying scientific issues (using academic knowledge),* while males were stronger at *explaining phenomena scientifically.*

Students' socio-economic differences accounted for a significant part of between school differences in some countries. This factor contributed most to between-school performance variation in the United States, the Czech Republic, Luxembourg, Belgium, the Slovak Republic, Germany, Greece, New Zealand, Bulgaria, Chile, Argentina and Uruguay.

There is no relationship between the size of countries and the average performance of 15- year-olds in PISA. There is also no cross-country relationship between the proportion of foreign-born students in countries and the average performance of countries.

International Physics Olympiads were started in 1965 and around 70 countries have sent students to compete these last 5 years. Chinese students consistently appear in the top three highest scores in these Olympiads, this fits in with the data that Dr. Bao our second speaker presented.

The "First Step to Nobel Prize" competition is not as well-known as the Olympiads and Dr Turlo showed the rankings for 2005 to 2007 and in this arena of the brightest students the USA students came in the top 3 positions.

The ROSE study– the Relevance of Science Education looks at children's attitudes towards studying science. Children from 36 different countries, including many in Africa who don't take part in the above studies, were asked how much they agreed with this statement: "*I like school science better than most other school subjects".* Their responses were plotted to show the percentage answering "Agree plus strongly agree" and they tracked female and male answers separately. At the top of the list with the highest percentage of children agreeing, and hardly any difference between girls and boys, is Bangladesh (~83%), with Uganda second (~80%); 5 other African countries: Ghana, Lethoso, Swaziland, Zimbabwe and Botswana all have agreement over 50%. Austria is the *only* European country where more than 50% of both girls and boys agree with the statement. The Scandinavian countries all cluster at the bottom of the plot with well under 40% agreeing with the statement, and Finland, who does so well in the PISA assessment has just 30% of boys and 21% of girls agreeing with the statement "I like school science better than most other school subjects". This is a fascinating set of results and during the discussion period after the speakers, Dr. Turlo told us how the researchers explained the wide range of country responses [Chinese children were not included in this study]. See the description of the discussion period below.

There are many factors that influence the effectiveness of teaching, e.g. fiscal and other resources, the student's family background, the overall school quality, the curriculum quality, and, of course "quality of the teachers". Next Dr. Turlo discussed what competencies a science teacher needs to be an effective and good quality teacher:

- Subject knowledge
- Subject application (pedagogy, methodology of teaching – learning)
- Class management
- Assessment (evaluation), recording of students' progress
- Further professional development: for reflection and creativeness, being able to innovate, applying inquiry methods, using modern technology to communicate, use foreign languages, work in collaboration, etc.

To ensure that teachers gain these competencies they must be included in teacher training standards, but the enthusiasm and motivation of a teacher are characteristics that are difficult to imbue through training, they have to come from within the person!

Much of Europe is engaged in K-12 science education reform, like the US and China; there are shortcomings in curriculum, pedagogy, assessment and teacher quality, but the deeper problem is one of a fundamental nature. School science education has never provided a satisfactory education for the majority. Now the evidence is that it is failing in its original purpose, to provide a route into science for future scientists. To help develop a plan for science education reform across Europe a committee of 19 experts (including our speaker Dr Turlo) was convened by the UK-based Nuffield Foundation and in 2008 they produced a report called *"Science Education in Europe: Critical Reflections",* the two main authors being J. Osborne and J. Dillon. This important report was addressed to the Ministries of Education of all European countries.

(Continued on page 19)

(Continued from page 18)

This report makes 7 recommendations which are reproduced here because they set a framework for improving science education, and are applicable to the teaching of physics and the training of physics teachers *in any country*, the subject of the Forum of International Physics' invited session which this newsletter article summarizes.

Recommendation 1
The primary goal of science education across the European Union (EU) should be to educate students both about the major explanations of the material world that science offers and about the way science works. Science courses whose basic aim is to provide a foundational education for future scientists and engineers should be optional.

Whilst science and technology are often seen as interesting to young people, such interest is not reflected in students' engagement with school science that fails to appeal to too many students. Girls, in particular, are less interested in school science and only a minority of girls select careers in physical science and engineering. The reasons for this state of affairs are complex but need to be addressed.

Let's exemplify the interest in science for boys and girls by listing the top 5 items boys would like to learn about in science and the top 5 for girls.

Top 5 items boys would like to learn about in science

1. Explosive chemicals;
2. How it feels to be weightless in space;
3. How the atom bomb functions;
4. Biological and chemical weapons and what they do to the human body;
5. Black holes, supernovae and other spectacular objects in outer space.

Top 5 items girls would like to learn about in science

1. Why we dream when we are sleeping and what the dreams might mean;
2. Cancer – what we know and how we can treat it;
3. How to perform first aid and use basic medical equipment;
4. How to exercise the body to keep fit and strong;
5. Sexually transmitted diseases and how to be protected against them

Recommendation 2
More attempts at innovative curricula and ways of organising the teaching of science that address the issue of low student motivation are required. These innovations need to be evaluated. In particular, a physical science curriculum that specifically focuses on developing an understanding of science in contexts that are known to interest girls should be developed and trialled within the European Union.

Recommendation 3
EU countries need to invest in improving the human and physical resources available to schools for informing students, both about careers *in* science – where the emphasis should be on why working in science is an important cultural and humanitarian activity – and careers *from* science, where the emphasis should be *on* the extensive range of potential careers that the study of science affords.

Recommendation 4
Student engagement or interest in science is largely formed by the age of 14. This situation has implications both for the formal curriculum and for opportunities to engage with science outside the classroom.

EU countries should ensure that:

- teachers of science of the highest quality are provided for students in primary and lower secondary school;
- the emphasis in science education before 14 should be on engaging students with science and scientific phenomena. Evidence suggests that this is best achieved through opportunities for extended investigative work and 'hands-on' experimentation and not through a stress on the acquisition of canonical concepts.

Recommendation 5
Developing and extending the ways in which science is taught is essential for improving student engagement. Transforming good teaching practice across the EU is a long-term project and will require significant and sus-

(Continued on page 20)

(Continued from page 19)
tained investment in continuous professional development.

Recommendation 6
EU governments should invest significantly in research and development work on assessment in science education. The aim should be to develop items and methods that assess the skills, knowledge and competencies expected of a scientifically literate citizen.

Recommendation 7
Good quality teachers, with up-to-date knowledge and skills, are the foundation of any system of formal science education. Systems to ensure the recruitment, retention and continuous professional training of such individuals must be a policy priority in Europe.

Dr. Turlo brought her presentation to a close with a reminder that research physicists also have responsibilities in physics education. She told us that two-time Nobel Prize winning physicist, Maria Sklodowska – Curie, had created the Society of Scientists for Experimental Teaching in 1907, and had been a physics teacher for a class of 12 year olds. Here are the features of the active teaching methods this Society used 100 years ago:

Features of Active Teaching Methods Used by Marie Curie and other famous scientists in 1907:

- not verbal teaching,
- learning from nature and demonstration of exciting science hands-on experiments with the use of low-cost materials, explained by great scientists,
- students kept active by doing individual investigations,
- lively discussion (brainstorming) with the use of simple and understandable language,
- acquiring valuable social skills through the personal examples of teacher-genius: hard-working, persistence, honesty, sensitivity for needs of others, etc.

Dr. Turlo's final remark was to quote a Chinese proverb:

"If you think that education is not important or too expensive you didn't try ignorance yet."

Panel Discussion

Following the 3 presentations there was time for comments from the audience and a few questions to the speakers. Here are some of those comments, questions and the answers. Considering the amount of time spent on studying by high school students in different countries it seems that US kids spend much less than most as they do so many extra-curricular activities. Teachers have to find what motivates children to learn science and use those things in their teaching. Teacher- assistants were effective in helping lower performing children. Does a country with high physics scores on the international assessments turn out more physicists? – No. Why do so many Chinese science students come to the USA for graduate school? Because the quality of US graduate school quality is better than that of Chinese graduate school and it is still hard to do basic science research in China. Is the USA draining the Chinese scientist population? - No.

There were many questions asked concerning not only the ways of training of pre-service teachers, but also methods for their in-service training, organization of schools, investment in education, teaching methods (student motivation), etc.

Furthermore, someone asked: Why do pupils in the less developed countries express more interest to learn about science topics as reported by the ROSE project? One can really notice a strong negative correlation between the average interest score and the level of development of particular country (HDI - human development index). The correlation between overall interest and HDI is - 0.85.

However, care should be taken when interpreting this overall result. One should *not* assert that children become less interested in science the more developed the country is. A better explanation for these data is rather to suggest that for children in (mainly) developing countries, going to school after the age of 15 is "luxury" or a "privilege". Hence, they are, in principle, happy to learn about nearly everything the school may offer. Kids in rich countries (with low rates of unemployment) can "afford" to see school more as a duty and an obligation more than as a privilege. Many students also think that school should be fun and entertaining. Therefore, they are more likely to express what they like and what they dislike. One might say that they are more "selective" in their choices. Additionally – A clear pattern is that topics that are close to what is often

(Continued on page 21)

(Continued from page 20)

found in science curricula and textbooks have low scores on the rating of interest among young learners from Europe and other well developed countries – they have in the modern society much more interesting things around such as: mobiles, TV, films, internet and computer games, etc.

The lively discussion period continued with many questions concerning not only the ‚methods for training pre-service teachers, but also methods for their in-service training; organization of schools; investment in education; teaching methods and student motivation.

What can we learn from physics teachers in high scoring countries on the TIMSS and PISA international assessments? :

Final words of advice from the three speakers:

Dr Pekka Hirvonen: "Education should be taken seriously; it's an investment for the future"
Dr Lei Bao: "It is not what we teach but **how** we teach that matters."
Dr Jozefina Turlo: "Follow the recommendations of the 2008 Nuffield Foundation report, *Science Education in Europe: Critical Reflections."*

Cherrill Spencer is a Member-at-Large of the FIP Executive Committee, and is a Mechanical Engineer at the SLAC National Accelerator Center at Stanford University.

Novel Ways to Communicate and Collaborate in Research

Blogosphere News from PASI 2010, Pan-American Studies Institute on Rare Isotope Physics, Brazil

Meredith Howard

Somehow I have managed to escape the gravitational pull of recent fads like Facebook and blogging. I prefer face to face, phone, and email communication, or the old fashioned venue of the local bar after a full day of talks. Penguin diagrams, after all, got their name as the product of discussions in a bar with a beverage in one hand and darts or a pool cue in the other. Networking is one important aspect of our profession that is rarely taught, but usually honed with some level of intuition and a fortifying dose of food.

There are people who sing Facebook's praises for facilitating easy communication with lost contacts or keeping up on current events in the minutia of collaborators' lives. Do I really want to hear every idea sans filter? No! If truly important news flashes over the blogosphere, it will come up at lunch.

That all changed when I went to PASI 2010, the Pan American Studies Institute on Rare Isotope Physics in Brazil over the first two weeks in August. Aside from the usual goals of gathering a broad base of rare isotope expertise for the benefit of the more junior attendees, PASI 2010 is testing a hypothesis- that non-traditional media like blogs, recordings, and online banks of talk slides can be effective tools in casting lasting resources for rare isotope physics beyond the reach of printed journals or direct contact with scientists. PASI features a web log, or blog, giving an account from the audience's chair, and a WIKI encyclopedic page.

Go to http://groups.nscl.msu.edu/jina/pasi2010/index.php/Main_Page for the web based proceedings for PASI 2010. You'll find a link for every speaker, including their talk slides and a video of their talk delivery, broad topic WIKI (What I Know Is) pages covering an array of rare isotope related nuclear physics topics fortified with links to other web resources, talks, and reference citations in the familiar printed journal format, a growing jargon page to help the novice, and a variety of aids that allowed the participants to get the most out of their time during PASI. As I write, 50 physicists are making small edits to the online resource in lieu of traditional proceedings.

I decided to answer a co-organizer's second round of pleas for blogger volunteers: attendees who would cover and post online the highlights or impressions of every talk, professional interactions during the week, and everything else in between. Together we were nine graduate students and postdocs from institutions in Brazil, Canada, Germany, and the United States. It was intimidating, to be sure. There is an art to articulating the important aspects of high and low level talks with both insight and humor. No one in highly interdisciplinary fields is an expert on everything. Indeed, students who liked an astrophysics workshop's blog appreciated getting someone else's take on what was important; having a contrast to the message they took away helped in surprising ways and provided some reassuring comfort during more overwhelming sessions.

Over dinner in Brazil, there was significant discussion of the lasting benefit after PASI. Will students really use it? If

(Continued on page 22)

(Continued from page 21)
they look, will they find our pages helpful or a self-indulgent exercise that produced inferior proceedings? With the participants having access to edit anything and everything, how much damage can one person do? The beauty of a WIKI is its flexibility for continual improvement. Will the fluid nature for creating a WIKI and lack of hard deadlines generate good intentions and risk little follow-through? One thing was clear. We don't know.

On the other hand, the PASI participants who dove in with gusto to this format change enjoyed extremely rich interactions outside of the talks. One late arriver told me that he enjoyed reading the blog during the week he missed. I watched a theorist approach my blogger group to jokingly scold one of us for not being tougher on him. They encouraged us and showed curiosity in what we thought and in our process for dividing blog work. There were no rules in the beginning, so we had the luxury of deciding both what we wanted to do and what the over arching goals would be.

The WIKI webpages were also self-selecting in nature. Every participant was asked to choose and join a group on one of a dozen topics and create a WIKI page relevant to rare isotope studies. There were no global instructions on format, depth, style, or even meeting times. "Pool ideas and content for webpages that would be viewed by people not in attendance- anyone in the world with internet access. Errors can be corrected by others in the group. Just do it." The broad mix of backgrounds meant handy availability of technical expertise, internet savvy and internet friendly media for posting. Everyone was qualified to make some contribution.

The general freedom was second nature. The first time a professor complained about the difficulty in filling a nuclear theory postdoc position, I posted a "Job Openings!" link. Within a few days, six jobs were posted in my blank space that I created. My worry is about the shelf life of this proceedings style. How long will it be before many are out of date and are ignored? Did our energy get sucked into making great resources that were only really useful in August 2010? This is a problem that will require creativity and attention in the future.

Scientists have gone from the chalk board, to the overhead transparency, to PowerPoint. How will we harness the internet to expand our footprints beyond the places and people we meet, beyond the borders of our own professional backyards? I am curious to find out myself, even more so now.

Dr. Meredith Howard is a postdoc in the nuclear structure group at Rutgers University. She works on Rare Isotope Beams and does her research work at ORNL and MSU.

The Pan-American Advanced Study Institute on the physics and astrophysics of rare nuclear isotopes was held from August 1 to August 13 2010 in the Tropical Tambau Hotel in Joao Pessoa, Brazil.

Conference Reports

The Amalfi Coast International Spring Seminar on Nuclear Physics,

These Seminars have been held since 1986 starting in Sorrento and continuing in Capri, Ischia, Amalfi, Ravello, Santa Agata sue dui Golfi, Maiori, Paestum, Vico Equense and Vietri. The venue was opened to scientists from all corners of the world with particular effort to attract and support those from remote areas and regions with unfavourable exchange rates. Over the years many collaborations and friendships were started.

The 10th International Spring Seminar on Nuclear Physics "New quests in nuclear structure" was held in Vietri sul Mare (a small town 50 km from Naples, 2 km from Salerno) from May 21 to 25, 2010. This Seminar has been the tenth in a series of meetings started in May 1986 and organized by A. Covello and collaborators at the University of Naples "Federico II". The main aim of these meetings is to bring together researchers from all over the world to discuss recent advances and new perspectives in nuclear structure experiment and theory in an informal and friendly atmosphere. Their truly international character was confirmed by the attendance at the Vietri meeting of about 100 participants coming from some 20 countries.

The highlights of the meeting were the study of exotic nuclei and the advances in the theory of nuclear structure. Nuclear structure studies of exotic nuclei are currently being performed in several laboratories where beams of radioactive nuclei are available. Meanwhile the development of new facilities, which will provide high-intensity beams, is in progress or under discussion in Europe, Asia and North America. At the Vietri meeting a comprehensive overview of this fascinating field and of future scenarios was given thanks to the participation of leaders of the most important projects. As regards nuclear structure theory, the impressive advances in pushing ahead its frontiers were highlighted. On the one hand, the new exciting results of spectroscopic studies of nuclei far from stability is giving impetus to theoretical studies of possible changes of nuclear structure. On the other hand, sustained efforts are being made to understand the properties of nuclei in terms of the basic interactions between the constituents. This means that a truly microscopic theory of nuclear structure is on the way.

The Vietri Seminar ended with a Round Table Discussion on the theme "Trends and Perspectives in Nuclear Structure". Six distinguished physicists, N. Benczer-Koller, B. A. Brown, A. Faessler, B. Fornal, O. Sorlin and I. Talmi took part in the panel and their remarks brought about the active involvement of the audience. The main outcome of the discussion was that nuclear structure physics is undergoing a real renaissance and one may look confidently forward to major developments in the years to come.

Aldo Covello is at the Istituto Nazionale di Fisica Nucleare (INFN) and the University of Napoli

Forum on International Physics Committees

EXECUTIVE COMMITTEE

Chair: Noemie Koller, Rutgers University
Chair Elect: Harvey Newman, CalTech
Vice Chair: William Barletta, Fermi Lab
Past Chair: John Clark, Washington University
Secretary/Treasurer: Noemi Mirkin, University of Michigan
Councillor: Herman Winick, Stanford University

Members-at-Large:
Paul Gueye, Hampton University
Cherrill Spencer, SLAC National Accelerator Center at Stanford University
Susana Hernandez, Universidad de Buenos Aires
Marie Saboungi, Argonne National Laboratory
Giulia Pancheri-Srivastava, INFN Frascati, Rome

Newsletter Editor: Ernie Malamud, University of Nevada, Reno
First Newsletter will be Spring 2011
Deadline for contributions is Feb. 1, 2011
Send to malamud@foothill.net

PROGRAM COMMITTEE
Harvey Newman, Chair

NOMINATING COMMITTEE
John Clark, Chair

FELLOWSHIP COMMITTEE
Noemie Koller, Chair

INTERNATIONAL TRAVEL GRANT AWARD COMMITTEE
William Barletta, Chair
Alberto F. Santoro, University of Rio de Janeiro

PROGRAM COMMITTEE
Harvey Newman, Chair

NOMINATING COMMITTEE
John Clark, Chair

FELLOWSHIP COMMITTEE
Noemie Koller, Chair