Forum on International Physics

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

Spring 2012 Newsletter

Ernie Malamud, Editor

IN THIS ISSUE

View from the Chair *William Barletta*

Changes

The New Year brings with it changes to our Executive Committee. Noémie Koller has completed her service in the Chair line. Join me in thanking her for her leadership and wise counsel. Likewise Susana Hernandez and Marie-Louise Saboungi have completed their terms as Members-at-Large of the Executive Committee. We thank them for their service to FIP and will welcome their continued advice.

Last year's elections brought us new EXCOM members. We welcome our Vice Chair Esen Ercan Alp and two new Members-at-Large, Sultana Nahar, Ohio State University, and Luisa Cifarelli, University of Bologna, President of the European Physical Society. Luisa's presence on our committee offers us a special opportunity to strengthen ties with our colleagues in the EPS.

March meeting highlights

The APS annual meetings will soon be upon us. In FIP as in many other units, the Chair Elect is responsible for organizing the invited sessions at the March and April meetings of the following year. To boost the visibility of our sessions this year, FIP has partnered with other APS units to bring a rich and varied set of topics to the meeting attendees.

The March meeting will have five invited sessions, sponsored or co-sponsored by FIP. The 2012 Sakharov prize winners, Richard Wilson of Harvard and Mulugeta Bekele of the University of Addis Ababa are being honored for their "tireless efforts in defense of human rights and freedom of expression and education anywhere in the world, and for inspiring students, colleagues and others to do the same." Wilson will speak at a session devoted to the life and intellectual heritage of Andre Sakharov. This session, co-sponsored with the Division of Physics of Beams (DPB) includes talks by Bruno Coppi, Robert Cahn, Yousef Makdisi, and Sakharov's daughter, Tatiana Yankelovich. Bekele has been asked to give his prize lecture at a second session co-sponsored with DPB, "Science Diplomacy: Physics in Africa and the Middle East." Other speakers include our FIP Councillor, Herman Winick, Sekazi Mtingwa, Christine Darve, and the 2012 Marshak Lecturer, Ömer Yavas of the Turkish Accelerator Center.

Energy supply and use is of keen interest to many of us and will be the focus of two of our sessions. With the Topical Group on Energy Research and Applications (GERA), we will sponsor the session, International Energy Perspectives. Speakers include Deputy Assistant Secretary of Energy, Carmine Difiglio (Economics of Energy Alternatives). Other talks are "Energy Perspectives in China" (M. Levine), the "Science Basis of Sustainable Energy" (A. Malazanoff), "Fuel from Sunlight" (E. Stechel) and "Future Trends in Nuclear Power" (R. Lester). The future of nuclear power after Fukushima will be the topic of an entire session jointly sponsored by the FIP, the Forum on Physics and Society (FPS), and the Division of Condensed Matter Physics. A review of "What Happened at Fukushima" (A. Omoto) will be followed by talks about improving reactor safety and perspectives on nuclear power in the US, China, and India. Rounding out our contribution to the March meeting will be a session devoted to the NSF Partnerships for International Research and Education (PIRE). The session will feature five technical talks about programs sponsored by PIRE grants. March is also the occasion for the FIP reception to be held on Tuesday evening in the Hancock Room - Westin Boston Waterfront starting at 6:00 pm. Please join us there.

April meeting highlights

At the annual April meeting FIP will have four sessions, all co-sponsored with other units. Two of these sessions, organized in collaboration with GERA, will focus on Energy Technologies for Developing Countries. Session I will offer three presentations on energy efficient heating, cooking, and lighting systems. Session II will offer talks about cost-effective, distributed

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energy supply and storage. We will continue our science diplomacy series, this time focusing on "Accelerator-based Science in Korea." The program, co-sponsored by the DPB, will feature the Beller Lectureship winner for 2012, Dongpil Min speaking about the KoRIA project for rare isotope production and acceleration. Lectures about new photon science facilities and industrial uses of accelerators complete the program. The last collaboration is with the Forum on Graduate Student Affairs to offer a panel discussion of issues faced by students and post-docs participating in international collaborations.

Freedom and safety of scientists

Unfortunately the freedom and safety of our scientific colleagues worldwide must remain an issue of our attention and concern. Freedom-of-inquiry remains one of our core values. The past year has witnessed imprisonment of scientists under politically motivated charges and extra-judicial assassination; these actions violate our deepest sense of human rights. I urge our members to become aware of the activities of the APS Committee on International Freedom of Scientists. Yet as we mobilize to aid our fellow scientists, we should recall that such actions are no less tolerable when the victims are from outside of our international scientific community.

A reawakening

I was pleased that in 2011, I along with the Directors of the CERN Accelerator School, the Russian School at Novosibirsk and the KEK School held a successful session of the Joint International Accelerator School (JAS) after a several year hiatus. The venue for the session was the Ettore Majorana Center for Scientific Culture in Erice, which generously made available several scholarships for students from developing countries. The Asian Committee on Future Accelerators has very recently accepted the proposal from KEK to hold the next JAS session in Japan in 2013.

The author, our FIP Chair, is Director of the US Particle Accelerator School, Visiting Professor in the Faculty of Economics of the University of Ljubljana, Coordinating Editor, Nuclear Instruments & Methods, and Adjunct Professor at MIT and UCLA.

American Physical Society Office of International Affairs

Amy Flatten

While 2012 will bring new opportunities for strengthening our international outreach and the Society's engagement with colleagues across the globe, I would like to take a moment to share with my friends in FIP the many activities we collectively accomplished during 2011. The partnership between FIP volunteers and the APS International Office is critical to our ongoing programs, and I hope you enjoy this recap of our fruitful efforts during 2011.

Over this past year, the Society especially focused upon better serving APS members living beyond US borders and upon reaching out to the international physics community. By establishing the International Friends of APS network, key contacts across the world served as the Society's representatives at their institutions, helping to plan APS activities and communicate with members in their local communities. This past year, the International Friends used Activity Grants from the Society to host local activities in such diverse locations as Cartagena, Colombia; Jerusalem, Israel; Taipei City, Taiwan; Hsinchu City, Taiwan; Bangalore, In-

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dia; and Warsaw, Poland.

The Society also worked to better serve those members who cannot travel to APS meetings, especially those living outside of the United States (nearly 25% of the non-student members). At the 2011 April Meeting in Anaheim, the APS conducted a trial of the usefulness and acceptance of online slide presentations by providing Internet access to speakers' slides from a broad cross-section of plenary, scientific and general-interest sessions that would appeal to a diverse audience. The Society advertised the trial to physicists worldwide, including those who were not yet APS members, and conducted an online survey of those who viewed the presentations. The results of the trial indicate that APS members, as well as non-members, place great value on accessing APS meeting presentations online. This provides the Society with new opportunities for expanding APS meeting participation by international physicists, students, and industrialists.

This past year, the APS partnered with other national physics societies toward a number of initiatives. With the Sociedade Brasileira de Física (SBF), we issued our first call for proposals for a new exchange program for physics graduate students and professors. Here, the Brazil-U.S. Physics Student Visitation Program offered graduate students a breadth of opportunities in physics, such as attending a short-course or summer institute; visiting with a professor in his/her field of study; working temporarily in a lab; or any other opportunity that the student and professor felt was worthy of travel support. The Brazil-U.S. Professorship/Lectureship Program funded physicists in Brazil and the United States that wished to visit overseas to teach a short course or deliver a lecture series in the other country.

The Society continued to partner with the Indo-U.S. Science and Technology Forum (IUSSTF) toward exchanges of graduate students and professors between the United States and India. This ongoing program funds physicists' visits overseas to teach short courses or provide a "physics lecture series" at US and Indian universities. The student visitation program not only enabled US students to conduct research in India's laboratories, but provided first-hand experience with Indian science, culture, and fostered opportunities for developing long-term collaboration.

In partnership with the UK Institute of Physics (IoP) and the Abdu Salam International Centre for Theoretical Physics (ICTP), the Society co-sponsored a workshop in Cebu City, the Philippines, designed for physicists and engineers from developing countries who are interested in learning entrepreneurial skills. Such an educational program is missing in many of the developing countries. The event attracted 63 participants who learned about issues such as intellectual property and business planning.

The Society partnered with the physical societies across North America for the Canadian-American-Mexican Physics Graduate Student Conference (CAM2011) that was hosted by the APS in Washington D.C. The CAM conferences are bi-annual meetings jointly sponsored by the American Physical Society (APS), the Canadian Association of Physicists (CAP), and the Sociedad Mexicana de Física (SMF). They provide a unique scientific meeting for physics graduate students and are organized by the students themselves, with mentorship from senior staff of the respective professional societies. The conference hosting rotates among the 3 co-sponsoring countries, and hence, the APS hosted CAM in 2011. The conference promoted international networking and career development for physics graduate students, encouraged collaborations among North America's young scientists, and exposed students to sub-disciplines of physics beyond their individual research. Along with the scientific sessions, hosting CAM2011 in Washington, D.C. also provided a unique opportunity to highlight the links among science, diplomacy and public policy.

The SESAME Travel Award Program, the Society's joint program with the European Physical Society (EPS), the UK Institute of Physics (IoP), and the German Physical Society (DPG), endeavors to build scientific capacity in the Middle East. The SESAME project --the synchrotron light source in Amman, Jordan, brings together physicists from Arab countries & Israel

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for international scientific collaboration. By enabling Middle Eastern physicists to avail themselves of training opportunities, the APS and other partnering societies have been building a synchrotron "user community" in the region.

The Society continued to bring international physicists to speak at APS meetings through both the Marshak and Beller Lectureships, which support distinguished physicists from the developed and developing countries respectively. The Society also continued its ongoing commitment to developing country physicists through its International Travel Grant Award Program (ITGAP). Twice this past year, the Society invited members of participating APS units to submit proposals for this expanding program, which is ever growing through support from sources beyond even APS.

The Society also partnered with other organizations toward the AAAS Science and Human Rights Coalition --a network of professional societies providing strengthened connections between the human rights and scientific communities. Through this Coalition, and through the efforts of its volunteers, the APS stressed the need for scientific organizations to advocate for the human rights of scientists in the US and around the world.

Throughout the past year, the APS continued its vigilance regarding important US Government policies that impact international scientific collaboration. The APS joined other scientific and higher education organizations to meet with State Department officials regarding new developments in visa processing. The APS will continue to work with federal leaders to ensure national security concerns do not unduly restrict scientific research with international colleagues.

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

From the Editor *Ernie Malamud*

The success of this newsletter depends on you, the members of FIP. I encourage you to send me (malamud@foothill.net) suggestions for topics and authors. We can also arrange a phone conversation.

The deadline for receipt of materials for the fall 2012 issue is August 1. It will help greatly if you can send me material in MSword format and graphical material as JPEGs. I prefer short, newsy (1000 words or less) articles. Photos and other graphical material enhance the newsletter. It also helps if you are covering more than one topic in an article to divide the material into several shorter articles.

Definition of Forum: "a medium for open discussion or voicing of ideas." Thus, very welcome are (short) Letters to the Editor commenting on FIP newsletter articles in recent issues.

I received an excellent and comprehensive article from Harvey Newman, our FIP Chair last year, and currently Past Chair, titled "High Energy Physics: Science and Technology Benefiting Humanity." In it Harvey reviews accelerators and particle beams and focuses on the many important applications in many fields. He discusses technology transfer, global networks, and of particular interest to members of our Forum the international aspects of this work. Newman discusses the digital divide, and internet connectivity as a basic human right. The paper is posted here and soon will be available on the web site for the Pontifical Academy International Symposium on Subnuclear Physics: Past, Present and Future http://www.vatican.va/roman_curia/pontifical_academies/acdscien/2011/bookletsubnuclear.pdf. I highly recommend it.

There are contributions to this newsletter from many different parts of the globe. I thank all of the authors for their contributions as well as our Newsletter Committee for their excellent suggestions

Ernie Malamud after three decades of work at Fermilab on high energy physics experiments and accelerator design and construction, retired to live in California. He is a Fermilab Scientist Emeritus and is on the adjunct faculty at the University of Nevada, Reno.

Calendar of FIP Sessions and Events at APS Spring Meetings

March Meeting 2012

February 27 - March 2, Boston Convention Center, Boston, Massachusetts

Monday, Feb 27—11:15AM. B2 Science Diplomacy: Africa and the Middle East Sponsor: FIP; Chair: William Barletta; Invited Speakers: Christine Darve, Sekazi Mtingwa, Herman Winick, Omer Yavas, Mulugeta Bekele.

Tuesday, Feb 28—11:15AM. J27 International Energy Perspectives Sponsors: FIP, GERA; Chair: William Barletta; Invited Speakers: Mark Levine, Carmine Difiglio, Richard Lester, Alexis Malozemoff, Ellen Stechel.

Tuesday, Feb 28 —2:30PM. L2 Andrei Sakharov Prize Session Sponsors: DPB, FIP; Chair: W. Barletta; Invited Speakers: Bruno Coppi, Robert Cahn, Tatiana Yankelevich, Richard Wilson, Yousef Makdisi.

Tuesday, Feb 28 — FIP Reception, begins at 6 to 8 pm in the Hancock Room, Westin Boston Waterfront Hotel Co-Sponsors: APS Office of International Affairs, Overseas Chinese Physics Association (OCPA), Association of Korean Physicists in America (AKPA), American Chapter of the Indian Physics Association (ACIPA), Iranian-American Physicists Group Network (IrAP). Please join us as we honor the FIP APS Fellows! Co-sponsors will also be giving out awards. The FIP reception is a wonderful opportunity to interact with speakers,officers of the American Physical Society, members of the co-sponsoring organizations, and your fellow FIP members!

Wednesday, Feb 29 —2:30PM. T2 PIRE in Condensed Matter Sponsor: FIP; Chair: Joan Frye; Invited Speakers: Junichiro Kono, Thomas Pruschke, Chang Yeol Ryu, Arthur Smith, Yasutomo Uemura.

Thurs, Mar 1—11:15AM. W20 Nuclear Power, One Year After Fukushima Sponsors: FPS, FIP, DCMP; Chair: David Wright; Invited Speakers: Akira Omoto, Stephen Kuczynski, Edwin Lyman, Yun Zhou, M.V. Ramana.

April Meeting 2012

March 31 - April 3, Atlanta, GA 100 Years of Cosmic Ray Physics
Held Jointly with the Sherwood Fusion Theory Conference

Apr 1 —10:45AM. H4 Science Diplomacy: Accelerator Based Science in Korea Sponsors: DPB, FIP; Chair: Kwang-Je Kim; Invited Speakers: Won Namkung, Dong-Pil Min, M.H. Cho.

Apr 1 —10:45AM. H6 Energy Services for the Developing World I Sponsors: GERA, FIP; Chair: Alvin Compaan; Invited Speakers: Ashok Gadgil, Kurt Kornbluth, Jeffrey Nelson.

Apr 1 — 1:30PM, J12 Invited Session: Energy Services for the Developing World II Sponsors: FIP GERA; Chair: Ellen Stechel; Invited Speakers: Alexie Kolpak, Chris Lyons, Trudy Forsyth.

Apr 3 — 10:45AM, W6 Panel Discussion: Challenges for Early Career Researchers in International Collaborations and Exchanges Sponsors: FIP FGSA; Chair: Renee Horton; Invited Speaker: Lindley Winslow.

Newly Elected to the FIP Executive Committee

Compiled by E. Malamud from excerpts from the candidate bios and statements

Esen Ercan Alp, Senior Scientist at Argonne National Laboratory was elected to Vice-Chair and the 4-year Chair Line term beginning in January 1 of this year.

Alp received BSc and MSc degrees from the Middle East Technical University in Ankara, and a PhD from Southern Illinois University. He has been a member of Argonne since 1984 and is also Visiting Professor at Northern Illinois University, and the University of Illinois at Champaign-Urbana.

He works at the Advanced Photon Source and is widely known for his work in nuclear resonant x-ray spectroscopy.

Alp was a member of the Canadian Light Source Science Advisory Committee 1999-2009. Together with Herman Winick, he chaired the first Scientific Committee for the SESAME project, and helped write the scientific case for a synchrotron in the Middle East. He also chairs the International Science Advisory Committee for the Turkish Accelerator Center. Dr. Alp received the University of Chicago Distinguished Scientific Performance Award in 1999.

Alp's education in three different countries with very distinct cultures and history, Turkey, Germany and the US, provides a perspective that allows him to deal with complex issues with a degree of moderation, respecting the unique conditions at different places. He has worked at different synchrotron radiation facilities in France, Germany, Japan, and the US, with scientists from different parts of the world. He understands the true nature of cross-disciplinary work, and is able to apply this experience in many international projects and appreciate the universal nature of the science as a human endeavor.

Alp comments: "The concerns we have for our scientific projects, the ambitions, the dreams, the sacrifices we are ready to make, points out this commonality, and hence brings us ever closer."

The two new Members-at Large of the 13-person FIP Executive Committee are Luisa Cifarelli and Sultana N. Nahar. Their 3-year terms began on January 1 of this year.

Luisa Cifarelli has been Full Professor of Experimental Physics in Italian Universities since 1991 and is now at the University of Bologna. Her research interests are very high energy subnuclear physics, in the framework of international collaboration experiments at major European laboratories, and astroparticle physics. In the last ten years she has been involved in the design, construction and running of the huge time-of-flight detector of ALICE at the LHC.

Cifarelli has served on several important councils, committees and commissions. She is President of the European Physical Society, President of the Italian Physical Society, and Fellow of the Institute of Physics; She is a member of the Scientific Committee of the *Centro Majorana* and has recently been appointed President of *Centro Fermi*. She also fulfills editorial duties on several European physics journals and at present is Editor-in-Chief of the new electronic journal EPJ-Plus.

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Cifarelli will pursue strengthening the relationships between the APS FIP and the EPS and thus significantly benefit the whole physics community on a global scale. Facilitating communications between the American and European physics communities will allow them to speak with a louder voice on all matters concerning physics that have an impact on everyday life, such as education, energy, environment, dissemination of scientific culture, scientific publications policy, and research strategy.

Sultana Nurun Nahar, an APS Fellow, is at Ohio State University. She was born in Bangladesh and is on the list of Pioneer Women of Bangladesh. Her current research is atomic radiative and collisional processes in astrophysical plasmas and X-ray spectroscopy of nanobiomedicine for cancer treatment. She is a member of the international collaborations of the Opacity Project and the Iron Project for the accurate study of atomic processes for astrophysical applications where she leads the radiative work.

Nahar has promoted physics research and education in developing countries since 1995. She gives seminars, contributes books and money, and provides guidance for research as well as helping students enroll in US PhD programs. In Bangladesh, she introduced research prizes and teachers awards. She works with students and faculty in Egypt, Turkey, Iran, India, and Chile. Nahar encourages Muslim women in science through the International Society of Muslim Women in Science (ISMWS) that she founded. Sultana was featured as the modern Muslim Scientist by the female science students at the United Arab Emirates University.

Nahar aims to connect the large community of physicists in the developing world to the APS. At present there are few physicists there who are able to afford the membership fees, and are therefore excluded from the myriad APS benefits. Nahar would like to explore special membership benefits, particularly participation in conferences for those scientists who are unable to pay the full fees. There are dedicated physicists doing remarkable work with meager resources and in a poor academic environment, Another objective is to institute targeted programs for women in developing countries and in Islamic countries where young women are interested in science, but unable to pursue it due to lack of information and encouragement. She has initiated scholarships and programs in Bangladesh and would like to extend those to other countries in South Asia and the Middle East.

INDIA-U.S. Travel Grants

Physicists and physics graduate students in India and the United States can apply for travel grants to pursue opportunities in the other country.

The **APS-IUSSTF 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. Awards are up to U.S. $4,000.

Through the **APS-IUSSTF Physics Student Visitation Program**, U.S. and Indian graduate students may apply for travel funds of U.S. $3,000 to pursue opportunities in physics. The travel funds could be used to attend a short-course or summer institute, to work temporarily in a laboratory, or for 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.

Further details about both programs, including proposal guidelines, are provided at: www.aps.org/programs/international/us-india-travel.cfm

This program is sponsored by the Indo-U.S. Science and Technology Forum (IUSSTF) and administered by the American Physical Society (APS).

APS physics

Deadline: Friday, 30 March 2012

IUSSTF

FIP Members Recognized as APS Fellows

It is a pleasure to recognize and congratulate eight of our members, shown below, who have recently been elected to APS Fellowship upon nomination by the FIP for their significant contributions to physics and the advancement of physics throughout the world.

Ashot Chilingarian, Yerevan Physics Institute, Armenia

Citation: For bringing one of the world's largest facilities for monitoring different species of secondary cosmic rays located in Armenia to the International Space Weather initiative as a global warning system from violent space events.

Yuan Feng, National University of Singapore, Singapore

Citation: For his contributions to the understanding of ferromagnetism in non-magnetic element doped semiconductors and new phenomena in carbon-based nano materials through computational studies and his untiring efforts in promoting international scientific collaborations in computational materials physics.

Jonathan Katz, Washington University, St Louis, US

Citation: For his significant and wide-ranging physics analyses at the interface of science and society, including nuclear weapons policy and the killing of oil well blow-outs.

Gui Long, Tsinghua University, Beijing, China

Citation: For his significant contribution in quantum information, including quantum secure direct communication, distributed quantum communication and quantum search algorithms, and for his important role in advancing physics and development in international physics.

William Rees, Los Alamos National Laboratory, US

Citation: For applying technical expertise and policy knowledge to strengthen the nation's physics enterprise.

Ashok Vaseashta, Department of State and Norwich Applied Research Institutes, US

Citation: For exceptional contributions and leadership in promoting scientific collaborations throughout America, Europe with focus in Black-Sea Region, and Asian-Pacific Rim for research in nanomaterials to solve grand challenges of the 21st century.

Yuh-Lin Wang, Academia Sinica, Taipeh, Taiwan

Citation: For his experimental work on surface nanoparticles, including the discovery of "surface magic clusters" with extraordinary stability, the creation of the first two-dimensional lattice of these clusters, and the demonstration of controllable high-density arrays for enhancing surface Raman scattering.

Tao Xiang, Chinese Academy of Science, Beijing, China

Citation: For his innovative contributions to the development of numerical renormalization group method and theoretical study of strongly correlated electronic systems, and for tireless promotion of international collaborations in condensed matter physics.

Hiroaki Yamamoto, California Institute of Technology, Pasadena, California, US

Citation: For his commitment to establishing the global gravitational wave network through his contributions to the design and conceptualization of the Large Cryogenic Gravitational Wave Telescope in Japan and the EU Advanced Virgo Interferometer in Italy.

Jinlong Yang University of Science & Technology of China, Hefei, China

Citation: For his original and outstanding contributions to single-molecule phenomena at surfaces, first-principles design of functional materials, and his efforts in promoting international scientific collaborations.

This NSF program may be of interest to our members. For more information go to http://www.nsf.gov/news/special_reports/savi/index.jsp

SAVI
NSF Science Across Virtual Institutes

Science Across Virtual Institutes (SAVI) is an innovative concept to foster interaction among scientists, engineers and educators around the globe. It is based on the knowledge that excellence in STEM (science, technology, engineering and mathematics) research and education exists in many parts of the world, and that scientific advances can be accelerated by scientists and engineers working together across international borders. Virtual institutes that connect researchers with common interests and goals will have a great impact on solving important societal challenges.

Human Rights Issues in Physics

Herman Winick

"There is no national science, just as there is no national multiplication table. Science that is national is not science." Anton Chekov

This is particularly true in physics, with the premier example of the thousands of scientists from dozens of countries working together at the LHC at CERN. In addition to working together at such central facilities (high energy physics, neutron sources, synchrotron light sources, telescopes, etc.), in all scientific fields scientists from many countries gather periodically at international conferences, group meetings, schools, and symposia. Getting to know each other personally from these contacts, and communicating regularly via email or Skype, provides opportunities for the rapid spread of information about human rights issues, including cases in countries with repressive governments where such information is not readily available.

In some situations it is possible for persecuted scientists, and other academics and scholars, to leave their home countries to escape danger. Two organizations that help in such cases are Scholars at Risk (SAR), based at NYU (www.scholarsatrisk.org), which helps arrange positions at participating universities in the network, and the Scholar Rescue Fund (www.scholarrescuefund.org) which provides up to $25K of matching funds to any university in the world that will invite an endangered scholar. These effective organizations have saved the careers, and sometimes the lives, of hundreds of endangered scholars. I have worked with them for more than 10 years. I highly recommend these organizations to you, and especially invite scientists to urge their institutions to join the Scholars at Risk's network.

There are other ways in which each of us can promote human rights, particularly when traveling abroad to countries with repressive governments. In addition to dedicating a talk to an imprisoned scientist or academic and expressing interest in meeting them or visiting with his/her family, human rights can be promoted by talking about relevant topics to everyone. For example, in addition to talking to scientist colleagues in countries such as Egypt, Iran, Jordan and Turkey, I have had such conversations with store clerks and taxi drivers about honor killings, women's rights, genital mutilation, homophobia, human trafficking, and stoning.

Invariably all with whom I spoke are against human rights abuses. They often put the blame for these abuses on their government, or on a small fraction of the population, or on tribal customs. The conversation can then lead to tactfully asking how they think that these conditions can be improved and what they are doing in this regard. This can also be followed up by emailing a relevant article to them.

As scientists we are privileged to travel and meet with colleagues around the world. Please consider this as an opportunity to promote human rights.

Professor Herman Winick is at Stanford University. He was Chair of the FIP in 2007 and currently the APS Councillor for the FIP, 2010-13.

Physics Diplomacy – Open Arms, Shared Goals and Global Challenges

Alice P. Gast

Whenever I attend an APS meeting, I am reminded of the common bonds among scientists. Renewing acquaintances and catching up with old friends, I think about how much we have in common, no matter where we come from. We may sometimes argue about best approaches to a problem or the validity of a theory, but all-in-all we speak the same language.

This is the foundation of the Science Envoy program launched in 2009 by the U.S. Department State. Envoys travel as private citizen scientists to designated countries to "seek to deepen existing ties and foster new relationships with foreign counterparts and gain insights from other nations about potential areas of collaboration that will help address global challenges and realize shared goals." [1] There have been six [2] science envoys to date, and my regions were Central Asia and the Caucasus. I traveled to Azerbaijan, Kazakhstan and Uzbekistan, and met with senior government officials, ministers and scientists, professors, students and business leaders. In this article, I will primarily focus on the physics and physical science research and education I saw in Kazakhstan and offer some observations from Azerbaijan and Uzbekistan.

The premise of science diplomacy holds true: Scientists can and will work across borders. Everywhere I met scientists on my travels as an envoy, I was welcomed with open arms. Some went out of their way to compliment things I had done; others spoke effusively about their laboratory or research group. It is true that through our common search for discovery we scientists, indeed, can be diplomats.

The countries I visited became independent of the Soviet Union in 1991. They benefited from the solid foundation of Soviet education, research and infrastructure. They also show the legacy of Soviet hierarchical separation of research and education, where a strong, top-down Academy ran large research institutes and large universities educated students and had little time for research.

Now in 2012, twenty years after the 1992 Nunn-Lugar Act's cooperative threat reduction program paved the way to eliminating nuclear weapons in former Soviet states, we are faced with an opportunity. Kazakhstan, in particular, is a country rich in oil, minerals and scientists. It is strategically located at the border of Russia and China and quickly building its trading and development opportunities with those neighbors. All three of these countries strongly desire to move from a commodity-based economy to an innovation economy. At the heart of this transformation, as we well know from US history, is research and education. We need to take this opportunity now to build collaborations, exchange students, visit and invite visits.

Kazakhstan - Integrating research and graduate education

In Kazakhstan, the benefits of the Soviet legacy and challenges they left behind are evident as they are working to integrate research and graduate education and to build on their strengths as physicists and mathematicians.

Nowhere is the challenge of change clearer than at the 15 year-old Eurasia National University (ENU) in Astana, Kazakhstan. Vice-Rector Rakhmetkazhi Bersimbayev described to me their approach to "transiting" to the US PhD system. Similar to a small American university, ENU has 13 schools with 10,000 students (800 Masters and 150 PhD). In order to enhance their graduate research, they have embarked on a program where graduate students will have two supervisors, one from Kazakhstan and one from the United States or the U.K. This collaboration helps alleviate one of their other challenges, a lack of adequate laboratory equipment. They carry out some solid-state physics and nanotechnology research with their own heavy ion accelerator, and they raise funds by running a commercial production line for nuclear track-etch membranes.

The heritage of strong physics research is apparent at the Institute of Nuclear Physics (INP). Founded in 1957 in Almaty, Kazakhstan, the INP pursues research in solid state physics, radioecology, and nuclear and radiation technologies. Deputy Director Petr Chakrov showed us their 6 MW light water research reactor,

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where they developed new methods in radioisotope production, radiation treatment of materials, ion-plasma synthesis of coatings, and radioactive waste management. The INP also works on radio-ecological monitoring and remediation of contaminated soil from sludge brought up by oil and gas extraction. In addition to the reactor, the INP has a cyclotron, a heavy ion accelerator, an electrostatic accelerator, and a commercial electron accelerator. In furtherance of the goal to integrate research and teaching, the INP accepts 150-200 graduate student interns each year. Some bridges to the United States exist: the INP has had collaborations with the University of Colorado, the University of Texas, Ohio University and Oakridge and Argonne National Laboratories.

"Global Challenges and Shared Goals" in Kazakhstan

Another legacy from the Soviet era is the aftermath of the cold war and the resulting security and environmental challenges. The 1992 Nunn-Lugar Act's cooperative threat reduction program focused serious attention on eliminating nuclear weapons in former Soviet states. The nuclear weapons program at the fast breeder reactor in Aktau left Kazakhstan with 3.3 tons of weapons grade plutonium and 11 tons of highly enriched uranium to dispose of. One of the key players in this work was KazAtomProm (KAP). Their president, Vladimir Shkolnik, described the close cooperation between Kazakhstan and the United States in the last 20 years. In addition to the successfully completed spent fuel program, Shkolnik cited collaborations with U.S. national laboratories, and the direct shipping and supply of uranium to U.S. nuclear companies. The INP has also contributed expertise in radioecology to help analyze and deal with the contamination at the Semipalatinsk nuclear test site. More recently, KAP's attention turned toward alternative energy projects and it seeks collaborators for work on solar energy.

Open our doors to Kazakh physicists

These are but three examples of institutions with strength in physics research in Kazakhstan. I encourage the APS and its members to not only welcome, but overtly invite, Kazakh researchers to visit the US, attend our meetings and visit our laboratories. Volunteer to co-advise students at Eurasia National University in Astana. Recruit graduate students from their generous Bolashak Scholars program. Invite postdocs to spend time in your laboratories. The possibilities are great for collaborations in Kazakhstan, and the scientists are eager to work on hard problems with colleagues from around the world. We can find common ground in the important problems of today and the universal language of physics. It is in our interest to help them build their research capacity and develop an innovation economy independent of their powerful neighbors.

Azerbaijan – large and strong Academy and Universities

In Azerbaijan, the structure reflects its Soviet roots. Research is carried out in the more than forty institutes comprising the National Academy. President Kerimov of the Azerbaijan National Academy of Sciences (ANAS) said that professors at universities, such as Baku State University and Azerbaijan State Oil Academy, have little time for research and it is best done by the 10,000 staff members of the ANAS. There are signs of change in Azerbaijan – a new nanotechnology initiative is gaining momentum and two newer smaller private universities, Khazar University and Qafqaz University, are teaching in English.

Open, peer-reviewed competition for research funds are important to develop internationally recognized science. Azerbaijan's Science Development Foundation has a dynamic young leader, Elchin Babayev**,** and an impressive young and engaging staff of grants officers. Ten months into their existence, they were launching their third competition for grants and running peer-reviewed competitions with a database of reviewers from the "scientific diaspora" of Azeri scientists. They are a model of transparency, with all proposal titles and funding levels displayed on the web. They share reports and have weekly seminars for scientists wanting to learn how to improve their proposals. They had a well-attended meeting at Baku State University on this topic. Their priorities are in nanotechnology, security and safety, geosciences, and biotechnology.

Uzbekistan – Physics research from ancient times to today

Physics research dates back six hundred years in Uzbekistan, and Samarkand is a striking site for a physicist to visit. This ancient city is home to many historic schools and mosques, and was a center of learning in the 15th century. The Ulugh Beg Astronomical Observatory was built around 1420 by Astronomer Ulugh

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Beg and was the largest instrument of its kind. It was a center of collaboration in its time, with some 60 -70 astronomers working there. When visiting, one can see the trench aligned with the Meridian that formed part of the sextant used to observe and accurately measure the positions of planets, stars, the sun and the moon.

Gast in front of the Ulugh Beg Astronomical Observatory in Samarkand, Uzbekistan

Today, that heritage of scholarly activity continues with a focus on health, clean water and food production, and a rather unique international resource, a solar furnace. The president of the Academy, Shavkat Salikhov, gave us a personal briefing describing the Academy, also structured in the Soviet model, with 48 research institutes carrying out the main scientific research in the country. He described their priorities on biotechnology, biochemistry, food security, and health. Their scientific strengths include researchers in chemistry especially fertilizer chemistry, pharmacy, renewable energy, and biotechnology research, especially genetic research on cotton. There is considerable activity in solar energy, and Uzbekistan and France operate a unique solar furnace which can reach temperatures of 2500 degrees and is an important test facility for materials.

The American Association for the Advancement of Science is organizing a 2012 workshop with Uzbek and American bioscience researchers meeting successively in Tashkent and in the U.S. Additional exchanges like this await the good ideas and energy of the scientific community.

Gast with Shavkat Salikhov, President of the Uzbek Academy of Science

Summary

My travels to Central Asia and the Caucasus resulted in valuable exchanges and goodwill. This is a beginning to what I hope will spread throughout the international science community. Science is truly a global enterprise, and scientists are natural diplomats.

Professor Alice P. Gast is the President of Lehigh University in Bethlehem, Pennsylvania. Dr. Gast, an internationally renowned scholar, researcher and academic leader, was appointed the 13th president of Lehigh University in 2006. Prior to her appointment at Lehigh, Dr. Gast served as the vice president for research and associate provost at the Massachusetts Institute of Technology and held the Robert T. Haslam chair in chemical engineering. She previously spent 16 years as a professor of chemical engineering at Stanford University and the Stanford Synchrotron Radiation Laboratory. In 2010, Dr. Gast was named to the prestigious post of science envoy by U.S. Secretary of State Hillary Rodham Clinton and the U.S. Department of State.

[1] Senator Lugar Announces Three New Science Envoys, Media Note, Office of the Spokesman, Washington DC, Sept. 17, 2010

[2] Three envoys were announced by Secretary Clinton in November 2009, Bruce Alberts, Elias Zerhouni and Ahmed Zewail. The second set of envoys was announced by Senator Richard Lugar in June 2010 and included myself, Gebisa Ejeta and Rita Colwell.

Nuclear Theory: Depth and Breadth of International Collaboration

Filomena Nunes and Vladimir Zelevinsky

Frontiers of nuclear physics in the XXI century moved in the direction of nuclei far from the valley of stability. There exist about 300 isotopes which are stable or have enormously long lifetimes. Other known isotopes (there are about 3000 of them) are unstable but with a lifetime that is long compared to the nuclear scale - they decay mainly by beta decay, alpha decay or spontaneous fission. Meanwhile, the estimates show that the full nuclear chart delineated by the driplines (where the nuclei become particle-unstable and decay in about 10^{-20} s or faster) should contain more than 7000 isotopes. In fact, we do not accurately know the properties of many of the recently discovered isotopes, and the limit of nuclear existence continues to be an open question in our field.

Why is this of great scientific interest? We list a few of the primary reasons for our quest. First of all, this is a testing ground of our ideas about nuclear structure in general. The new isotopes are loosely bound and we can expect many surprises concerning nuclear shells, shapes, and reactions. It is not clear if our standard models and theoretical approaches will work under such conditions. Second, nucleosynthesis in the Universe mostly proceeds through nuclei far from stability and the knowledge of such nuclei is the main instrument for understanding crucial astrophysical problems. Third, nuclear physics had already provided many ideas and theoretical tools for mesoscopic science, and now we can approach problems of complexity and many-body chaos for open and marginally stable quantum systems, problems of great importance for quantum information, atoms in traps, soft condensed matter, and even biophysics. Fourth, one can hope to find among the new isotopes the best candidates to look for the violation of fundamental symmetries in nature. Finally, but not the least in importance, one can anticipate many practical applications of rare isotopes.

There are a number of large world centers where the experimental effort focuses on rare isotope science. In the US, the leading institution is Michigan State University with its National Superconducting Cyclotron Laboratory (NSCL). The new Facility for Rare Isotope Beams (FRIB) approved by the Department of Energy is under design with construction scheduled to start later this year. NSCL/FRIB will be the largest university-based laboratory in the country with full staff exceeding five hundred people, including more than sixty graduate students (the graduate nuclear physics program at MSU is ranked No. 1 in the US) and more than thirty faculty. The number of users for FRIB is expected to approach a thousand per year, from all over the world. The rare isotopes will be created in the fragmentation reaction of the primary beams (from protons to uranium with energy about 200 MeV/nucleon) on various targets. The high production rate of rare isotopes will make possible their separation, collimation, stopping for laser spectroscopy or reacceleration to energies around and above the Coulomb barrier. The completion of the FRIB project is expected in 2018 - 2020.

Similar efforts are underway in several countries around the globe. The new international accelerator center FAIR (Facility for Antiproton and Ion Research) for intense, high-energy beams of ions and antiprotons is under construction at the GSI (Darmstadt, Germany). This facility will operate at higher energies and partly be directed to antiproton and hadron physics, still with great perspectives for nuclear physics, especially due to the cooling rings planned in cooperation with the Budker Institute of Nuclear Physics (Novosibirsk, Russia). Another major player in this arena is Japan with its RIKEN Nishina Center for Accelerator Based Science (RIKEN is a broad scientific organization spread over the country similarly to the Max-Planck Institutes in Germany). Here there are opportunities to use various beams at energy 300-400 MeV/nucleon for fragmentation reactions or in flight uranium beams for fission products. The TRIUMF center in Vancouver, Canada, with its world's largest cyclotron and Isotope Separator and Accelerator (ISAC) facility uses the isotope separation on-line (ISOL) technique to produce rare isotope beams. Grand Accelerateur National d'Ions Lourds (GANIL) in France is going to finish its new project SPIRAL-2 in 2013 and this, together with CERN, can serve in the future as a seed for the huge EURISOL proposal (European Isotope Separation On-Line).

Nuclear theory plays an extremely important role in the study of rare isotopes. It provides frameworks to understand new phenomena, as well as new directions to explore, and enables a translation of the enormous nuclear complexity contained in the data into a tangible language. As in experimental nuclear physics, the technological developments are changing the paradigm for nuclear theory. The complexity of the problems we are trying to solve requires varied expertise.

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Because resources are limited, it is vital to coordinate the efforts and find effective solutions. The role of collaborations has thus never been more important in nuclear theory, collaborations that cross borders and oceans.

Informal collaborations have always existed in nuclear theory. However, over the last decade we have seen a true shift in the way nuclear theorists organize their work. Already in the early nineties, a formal recognition of the importance of collaborations in theory was made when establishing the INT (Institute for Nuclear Theory at the University of Washington in Seattle) and the ECT* (The European Center for Theoretical Studies in Nuclear Physics and related areas) in Trento (Italy). Since their creation, these institutions have enabled and nurtured many fruitful collaborations on a variety of theoretical topics, bringing together theorists from all over the world for workshops or programs. The new direction in nuclear physics, the study at Brookhaven National Laboratory of relativistic nuclear collisions at extreme energies, when the nucleons liberate their constituents, quark and gluons, and form new states of matter, was strongly supported by the efforts of the BNL-RIKEN theoretical center. Over the last decade, additional focused investments have been made: JUSTIPEN (Japan - US Theory Institute for the Physics with Exotic Nuclei) was established in 2006, to foster collaborations between nuclear theorists in the US and in Japan; FUSTIPEN was created in 2010, with a similar purpose to strengthen collaborations between nuclear theorists in France and in the US and now CUSTIPEN is being proposed to develop collaborations between China and the US. No doubt, funding agencies are also recognizing the need for large collaborations in the theory for rare isotopes, one example being UNEDF, a Department of Energy initiative which brought together close to 50 theorists in the US to develop a Universal Nuclear Energy Density Functional (www.unedf.org).

Despite the variety of collaborations worldwide, very often efforts are not internationally coordinated nor aligned with the experimental programs. With the construction of FRIB, the local nuclear theory group at Michigan State University feels that such a coordination should be a priority. The NSCL nuclear theory group has eight faculty members, four postdocs and twelve doctoral students. Reflecting the importance of international collaborations, the group also has seven adjunct faculty from all over the world. (For more detail see http://groups.nscl.msu.edu/theory/). At this time, it is important to go beyond small unstructured collaborative work, and provide a reliable framework to establish strong collaborations, bringing together the variety of expertise that can effectively tackle a relevant problem within a relevant timescale. It is with this mission in mind that, working together with other large rare isotope laboratories in the world, including GSI and RIKEN, the NSCL nuclear theory group hopes to establish ICNT (International Collaborations in Nuclear Theory).

Last year the world scientific community celebrated the first century of nuclear science that began with the discovery of the atomic nucleus by Rutherford. Nuclear theory now connects far reaching frontiers from fundamental problems of the microworld to cosmology, and from practical energy problems to quantum information and mesoscopic physics. The science of rare isotopes is an extremely interesting experimental and intellectual enterprise that should unite physicists of different countries in their quest for new and deep knowledge.

Filomena Nunes and Vladimir Zelevinsky are at the National Superconducting Cyclotron Laboratory and the Department of Physics and Astronomy, Michigan State University, East Lansing, Michigan

The ANDES Deep Underground Laboratory *Xavier Bertou*

Underground science is living in exciting times. This year we celebrate 100 years from the first flight of Victor Hess leading to the discovery of cosmic rays. While cosmic rays have helped a lot in the understanding of particles in the early years, they are now a source of noise for many high-energy physics experiments. To escape from this unwanted background, tens of different experiments have moved to laboratories thousands of feet below ground level, to look for elusive neutrinos or dark matter particles.

Many of these studies are aiming at a better understanding of the neutrino. How does it oscillate? What kind of particle is it? What mass does it have? And after the surprising result of the Opera experiment at the Gran Sasso underground laboratory last year, do they really travel faster than light?

Not less interesting is dark matter, expected to be 85% of the total matter of the Universe. Dark matter searches are performed in deep underground laboratories all over the world, and while no clear direct signal has been seen yet, 3 different experiments are seeing a counting rate modulation which could well actually come from the movement of the earth through the dark matter halo of our galaxy. However, such a modulation could also be faked by more mundane effects related to atmospheric changes. To get a definitive answer, this modulation should be measured in the southern hemisphere. A similar modulation would be the sign of a genuine dark matter signal, while an opposite modulation is explained by an atmospheric effect. Unfortunately, all the current underground laboratories are located in the northern hemisphere.

In the last decade, strong efforts have been made in Latin America towards a better integration, and the booming economies of the region have been looking forward to the Asian market. Linking commercially the productive areas of Brazil and Argentina to Asia implies the construction of complementary accesses to the Pacific through the Andes. One of the main projects being pushed forward is the Agua Negra tunnel, to be dug under the Andes between the Chilean 4th region of Coquimbo and the Argentine province of San Juan. It will be a double 14 km long road tunnel, and its deepest point will have more than 1750 m of rock overburden. This tunnel is, in other words, an ideal location for a world class deep underground laboratory, the first in the southern hemisphere.

The construction of the ANDES deep underground laboratory has been pushed forward since 2010. While not initially thought of as an acronym, ANDES can stand for Agua Negra Deep Experiment Site. The foreseen underground layout will consist of various halls for a total volume of more than 60,000 m^3 over about 4,000 m^2 to harbour all the necessary equipment for several major experiments. The dark matter program will of course be a highlight of the facility, and repeating any modulation seeing experiments in the southern hemisphere will be the first target. In the neutrino sector, a large detector able to detect low energy neutrinos is being designed, mainly focused on neutrinos from solar and supernovae origin, as well as geoneutrinos. Geoneutrinos are neutrinos produced by the decay of radioactive products in the Earth (mainly potassium, uranium and thorium), and are thought to be of extreme relevance for the heat budget of the Earth. ANDES is at a unique location to make this measurement, as not only the geoneutrino flux is expected to be high due to the thick Earth crust at the level of the Andes, but also because one of the main backgrounds in this measurement, neutrinos from nuclear power plants, is absent (there are few nuclear power plants in the region, compared to other laboratories where such measurements are conducted).

The location of ANDES is also unique as it is located close to an active seismological region. In addition to the measurement of geoneutrinos, this is an ideal site for a full geophysics underground laboratory, linked to both the Chilean and the Argentine network of seismographs. The laboratory will also host an ultra low radiation measurement area, important to select high purity material for neutrino and Dark Matter experiments, but also for environmental studies.

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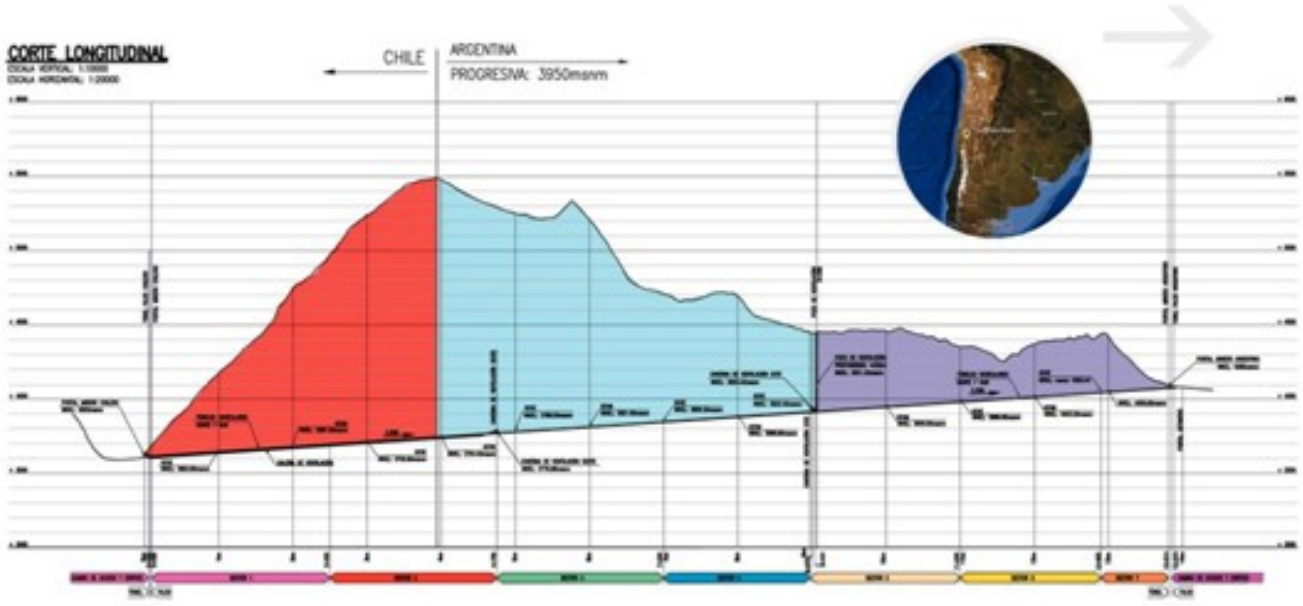
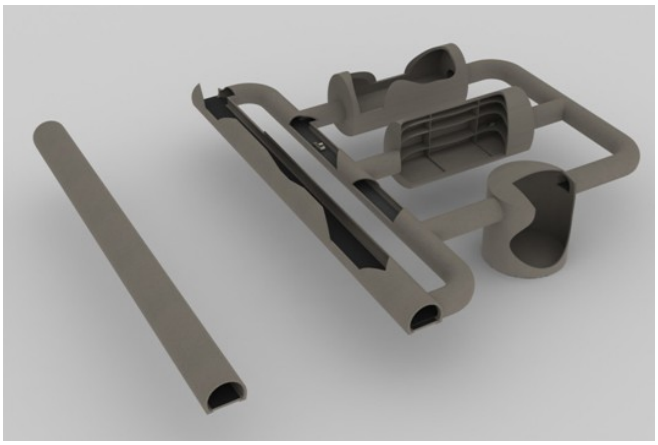
Taking into account that the Agua Negra tunnel is an important project of regional integration, ANDES was seen as a similar opportunity, at a time where science is well promoted in most Latin American countries. In order to build and operate the ANDES laboratory, a larger body, the CLES (Latin American Consortium for Underground Science, in Spanish and/or Portuguese), is being considered. The CLES is thought of as the natural body to operate, finance, and plan the scientific roadmap for ANDES, and as a way to promote the academic integration among Latin American countries participating in the project. The four countries currently being actively part of the CLES are Argentina, Brazil, Chile and Mexico, but it is foreseen more will join in the future. It is a unique opportunity not only to host international experiments and to build an international laboratory, but also to create an international body in charge of coordinating these activities together with academic development and integration, human resources formation, and a rich technical, social and outreach program.

Underground science is really living in exciting times.

Xavier Bertou is head of the department in the high energy research and technology unit of CNEA, associated researcher of CONICET, and coordinates the ANDES initiative. He works at Centro Atómico Bariloche in Argentina.



Longitudinal section of the planned Agua Negra road tunnel. ANDES would be located at the deepest point, with more than 1750m of rock overburden.



3D conceptual view of a possible layout of ANDES and its connection to the two Agua Negra road tunnels.

The Large Aperture Gamma Ray Observatory (LAGO) *Luis Villaseñor*

Gamma-ray bursts (GRBs) are the most powerful explosions in the Universe. They were serendipitously discovered in 1967 by the Vela (from the Spanish verb *velar*, which means "to watch") satellites launched by the US government to monitor covert nuclear tests from space. The Vela program studied GRBs further and they declassified and published their discovery in 1973. Ever since, GRBs have been the focus of intense observational and theoretical research from the astrophysical community.

An important breakthrough in their understanding occurred in May 1997, when the spectrum of the optical afterglow of a GRB, detected by the BeppoSAX satellite a few hours earlier in a faint and distant galaxy, was analyzed; the redshift measured for that particular galaxy placed it at an approximate distance of 6 billion light years from Earth. This ends a long controversy about the origin of GRBs and making clear that they are extragalactic events originating within faint galaxies at enormous distances.

GRBs are characterized by the sudden emission of gamma rays during very short time intervals (between 0.1 and 100 seconds). The integrated luminosities are typically between 10^{51} and 10^{55} ergs, i.e., much greater than the integrated luminosity of a typical star, like our Sun, during its whole lifetime. The astrophysical sources of these bursts are still unclear but good candidates are coalescence of compact objects (neutron stars) for short bursts (less than 2 s), and supernovae produced by very massive stars (hypernovae) for the long bursts (more than 2 s).

Although past (BATSE/CGRO, BeppoSAX**)** and present satellite observations (SWIFT, FERMI) have revealed some mysteries about the origin and location of GRBs, some important questions remain associated with higher energies (>1 GeV), such as their energy spectrum or the existence of a cut-off energy. Up to now no ground-based experiment has detected the gamma rays from GRBs.

The Large Aperture Gamma Ray Observatory, or LAGO, is a multi-site facility designed to observe the high-energy component of GRBs. This international collaboration, formed by approximately 75 people from 25 scientific institutes representing 12 countries, has constructed, starting in 2006, a network of ground-based water Cherenkov detectors (WCDs). Located at mountain altitudes, above 4500 m.a.s.l., to study high-energy GRBs, where the flux of the primary gamma rays is too low for effective detection by small-area satellite-borne detectors, LAGO has been taking data since 2007.

When high-energy photons from a GRB reach the atmosphere, they produce cosmic-ray cascades that can be detectable at ground level by using WCDs. These detectors are placed at mountain altitudes to increase their sensibility to primary gamma rays. Rather than trying to detect the extensive air showers produced by the primary gamma rays, LAGO makes use of the so-called single-particle technique to indirectly detect the bursts of high-energy gamma rays by trying to observe excess in the counting rates of secondary cosmic rays during the duration of the bursts. The main advantage of water Cherenkov detectors with respect to other detectors used for this purpose in previous experiments, such as plastic scintillators, is their higher sensitivity to photons, which represent up to 90% of the secondary particles at ground level for high-energy primary photons.

At present the LAGO Observatory consists of three sites in operation:

- Sierra Negra in Mexico at 4550 m.a.s.l. This was the first LAGO site, in operation since 2007. Three 4 m^2 and two 1 m^2 WCD have been in operation at the site. Currently, new water Cherenkov detectors of 40 m^2 are under construction.
- Chacaltaya in Bolivia at 5250 m.a.s.l. This is the highest site of LAGO and the one with the best infrastructure. Three WCD are in, two of 4 m^2 and one of 1 m^2. They have been taking data since 2008.
- Marcapomacocha in Peru at 4450 m.a.s.l. This is the most recent LAGO site, with one 2 m^2 WCD taking

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data since 2010.

Various other WCDs are installed or being installed:

- Centro Atomico Bariloche in Argentina, a prototype is used for calibration and software tests since 2006.
- WCD prototypes are taking data at several universities (Caracas and Merida in Venezuela, Bucaramanga in Colombia, Lima and Cuzco in Peru, Morelia and Puebla in Mexico and Guatemala City in Guatemala)
- Pico Espejo, in Merida, Venezuela, where three 4 m^2 WCDs have been installed at 4750 m.a.s.l. Unfortunately, the Merida cable car had a failure and was shut down in 2008.

New sites, in Guatemala, Chile and Brazil, are expected to join LAGO in the near future. All the LAGO sites were selected on the basis of their high altitude, simultaneous view of parts of the sky, good infrastructure and easy access. A prerequisite has been the existence of nearby groups of physicists interested in the construction and operation of their respective site.

The WCDs in all the sites share similar characteristics: They are filled with high quality purified water up to a level of 1.2 to 1.5 m, ensuring a full efficiency for photon detection through pair production in the water volume. The water is contained in a reflective and diffusive bag to achieve optimal uniformity of the detector response. A single photomultiplier tube, usually 8" in diameter overlooks the water volume. The signal is digitized and read out by custom-made electronics and software.

Although no GRBs have been observed by LAGO to date, their data have been used to set limits on the integrated energy flux of GRBs detected by satellites, with the most stringent one being 1.6×10^{-6} erg cm^{-2} for GRB 080904 in the 0.5 GeV - 100 GeV energy range. LAGO data are also used to monitor solar activity through the modulation effect that solar activity has on galactic cosmic rays, giving rise to Forbush decreases. A monitoring program has started to provide an observation network of solar activity, complementary to the existing network of neutron detectors.

Luis Manuel Villasenor-Cendejas is the Scientific Research Coordinator at Universidad Michoacana de San Nicolas de Hidalgo and also a member of the Institute of Physics and Mathematics at the same university in Morelia, Mexico.

Members of the LAGO collaboration in the Marpacomapocho site in Peru.

LAGO sites: Sierra Negra in Mexico (upper left), Pico Espejo in Venezuela (upper right), Marcapomacocha in Peru (lower left) and Chacaltaya in Bolivia (lower right).

Synchrotron Science on the move in South Africa

Sekazi K. Mtingwa

Excitement is growing within South Africa's synchrotron light source user community. That excitement led to a two-day workshop, held December 1-2, 2011, in Pretoria to finalize plans for the drafting of a strategic plan document to be submitted to the government's Department of Science and Technology (DST), which is broadly responsible for science and technology in the country, and the National Research Foundation (NRF), which is responsible for the distribution of research funding similar to what the National Science Foundation does in the United States. Top officials from those agencies attended the workshop, including Romilla Maharaj, NRF Executive Director of Human and Institutional Capacity Development; Rakeshnie Ramoutar, NRF Program Director of Strategic Platforms; and Takalani Nemaungani, DST Director of Global Projects. Daniel Adams, Chief Director: Emerging Research Areas & Infrastructure at the DST provided funding for the workshop and the South African Institute of Physics (SAIP), which is similar to our American Physical Society, handled the logistics.

The entity that mainly drove convening the workshop was the Synchrotron Research Roadmap Implementation Committee (SRRIC), which is chaired by Tshepo Ntsoane from the South African Nuclear Energy Corporation (NECSA) and co-chaired by Wolf-Dieter Schubert from the University of the Western Cape.

Approximately forty scientists attended the meeting, including those from international facilities. Herman Winick of SLAC and Sekazi Mtingwa of MIT attended, and Brookhaven National Laboratory's Erik Johnson and Ken Evans-Lutterodt joined via teleconferencing. Johnson and Evans-Lutterodt discussed the pros and cons of South Africa's inheriting Brookhaven's second generation light source called the National Synchrotron Light Source, which is soon to be replaced by NSLS II. However, the consensus of the workshop was that a new third generation facility would much better serve national and regional needs. The largest contingent of foreign visitors were from the various European light sources, including José Baruchel, Jürgen Härtwig, and the Laboratory Director General, Francesco Sette, from the European Synchrotron Radiation Facility (ESRF) in Grenoble, France; Jasper Plaisier from Elettra in Trieste, Italy; Trevor Rayment from Diamond in Oxfordshire, UK; and Hermann Franz from Petra III in Hamburg, Germany. Oxford University's Angus Kirkland did an outstanding job of facilitating the two-day meeting.

South Africa is relatively new to the international community of synchrotron light source users. Simon Connell, of the University of Johannesburg, has documented the history of South African scientists' usage of synchrotron radiation. The first were Trevor Derry and Jacques Pierre Friederich "Friedel" Sellschop (deceased), both from the University of the Witwatersrand (Wits). In 1994, Derry performed studies of diamond surfaces at both the Synchrotron Radiation Source-Daresbury Laboratory and ESRF. During the same year, Sellschop participated in other diamond studies at ESRF. Then in 1996, Giovanni Hearne, currently at the University of Johannesburg, used the facility at ESRF to study materials under extreme pressures. Bryan Doyle, now at the University of Johannesburg, served as a postdoctoral researcher at ESRF around 1999. From those early efforts, the synchrotron light source user community started to grow.

Hearne's early experiences at ESRF so excited him that, upon returning to South Africa, he wrote a two-page letter to Khotso Mokhele, then President of the Foundation for Research Development (now the National Research Foundation), to share those experiences and impress upon him that a synchrotron light source is a key single tool that could have wide impact across many scientific disciplines. Moreover, Hearne suggested that a long-term goal should be for South Africa to construct its own light source via a consortium of international partners, especially involving neighboring countries in Southern Africa.

In 2002, at the urging of the Edward Bouchet-Abdus

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Salam Institute (EBASI), which is an organization based at the International Centre for Theoretical Physics (ICTP) in Trieste that promotes African – African American collaborations, the African Laser Centre included the design and construction of a synchrotron light source as a long-term goal in its *Strategy and Business Plan*. Next, Tony Joel and Gabriel Nothnagel of NECSA co-authored a motivational paper entitled, *The South African Light Source: Proposal for a Feasibility Study for the Establishment of an African Synchrotron Radiation Facility* (2003), followed by Tony Joel's paper, *The South African Synchrotron Initiative: The South African Light Source: A Synchrotron for Africa - Strategic Plan* (2004). On another front, in 2004, the DST/NRF/SAIP commissioned an international panel of experts that released the report, *Shaping the Future of Physics in South Africa*, which called for consideration of new flagship projects to complement those in astronomy, such as the South African Large Telescope (SALT) and the Square Kilometre Array (SKA). They used a synchrotron light source as a prime example of such a project. Key members of that panel from the U.S. were Ken Evans-Lutterodt, S. James Gates from the University of Maryland-College Park, and Guebre Tessema from the NSF.

The first organizational structure for a synchrotron science community took shape in 2003, when a committee of synchrotron users established the South African Synchrotron Initiative (SASI). Van Zyl de Villiers of NECSA played a key role in getting DST's participation in SASI activities. The leadership of SASI mainly consisted of Tony Joel; Simon Connell; Giovanni Hearne; and Lowry Conradie, an accelerator physicist from South Africa's national accelerator center called iThemba LABS, located just outside of Cape Town. As a result of its participation with SASI, in January 2005, the DST itself assumed a leading role in building the synchrotron science community by forming the Synchrotron Task Team (STT), with Tshepo Seekoe of the DST serving as Chair and Simon Connell leading the development of the science case. It was during this period that the synchrotron science community began to mobilize as a coherent group.

With the assistance of SOLEIL, ESRF and other organizations, the STT organized the first two of a series of roughly biennial Science @ Synchrotrons Conferences (S@S) in November 2005 and February 2007. Both conferences were extremely successful in developing new projects and sparking the interest of students in synchrotron light source training. Members of the U.S. physics community, including Herman Winick, Alfred Msezane of Clark Atlanta University, and Sekazi Mtingwa, participated in planning and giving presentations at those conferences, which helped to establish a close partnership between South African synchrotron users and their foreign colleagues, especially the French. After the second conference in 2007, the synchrotron community further empowered itself with the establishment of SRRIC, which succeeded the STT in championing synchrotron science in South Africa. The first Chairs of SRRIC were Simon Connell and Giovanni Hearne. Following the S@S conference in February 2009, Brian Doyle assumed the Chair, followed by Tshepo Ntsoane.

All the above-mentioned activities culminated in the excitement that birthed the December 2011 Strategic Plan Workshop. The NRF representatives requested that SRRIC document the outputs of the workshop by March 2012 in the form of a white paper strategic plan. Then it would study the white paper to determine if it would give the go-ahead for the development of a detailed business plan by June 2012. Those dates were selected to coincide with the dates of the various stages of the government's budgeting process. SSRIC appointed a three-person committee to write the strategic plan, consisting of Brian Masara, Executive Officer of SAIP; Douglas Sanyahumbi, Director of the Technology Transfer Office at the University of the Western Cape; and Sekazi Mtingwa, with the latter chairing the committee.

Although the strategic plan has not been completed, there are some overarching comments that can be made. First, there is widespread agreement that the mission of SRRIC going forward will be as follows: To support and facilitate the development and growth

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of synchrotron science in South Africa in order to ensure that it contributes to excellence in science, innovation and industrial development by exploiting the benefits of synchrotron radiation in advancing fundamental and applied science through

1. Developing human capital, including attracting back the African scientific Diaspora (brain gain) and mitigating any threat of brain drain of young South Africans who have recognized this as a key research tool for their career development;
2. Developing key and/or strategic international collaborations;
3. Ensuring financial support to South Africans whose proposals successfully compete for beam-time at international synchrotron facilities; and
4. Promoting awareness and use of synchrotron science and its capacity to enable the exploration of new frontiers of technology.

In pursuing this mission, the synchrotron science community and the government must undertake a number of key initiatives, including

1. Deciding at what level it should formalize its relationships with foreign light source facilities, especially with ESRF, which is the most heavily used by South African researchers; (Francesco Sette invited South Africa to join ESRF as a Scientific Associate at the 1% level, since its researchers' utilization of that facility is already approximately at that level.)
2. Studying the feasibility of constructing South African or multinational beam-lines at foreign synchrotron facilities;
3. Promoting a significant growth in the number of synchrotron users, with a heavy emphasis on increasing the number of students being trained, such as at the many synchrotron radiation schools that are offered at a number of international facilities and institutions, such as ICTP;
4. Developing programs to preserve and expand the existing

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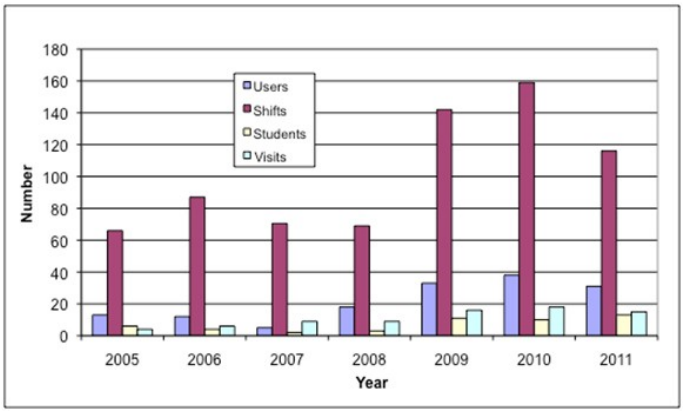
technical expertise, such as sending scientists and engineers abroad to join accelerator teams at foreign facilities to expand capabilities in areas such as ultra-high vacuum systems, radiofrequency cavities, magnets, power supplies, and controls;

5. Improving the local, critical feeder infrastructure that allows researchers to prepare and analyze samples before and after being shipped for studies at foreign synchrotron facilities
6. Promoting greater involvement of industrial users;
7. Studying the feasibility for constructing a third generation light source;
8. Developing mechanisms to educate the public about the revolutions in science and technology, such as the discovery of new pharmaceuticals, that synchrotrons afford.

The figure provides a plot of South Africa's synchrotron light source usage in terms of the number of users, beam-line shifts, graduate students trained, and visits to synchrotron facilities. The data represent a rough approximation, based on preliminary surveys; however, note that the 2011 data represent only part of the year, since 2011 had not ended by the time of the workshop. According to the data, the number of students trained at foreign facilities has increased from six (6) in 2005 to thirteen (13) in 2011, thus showing a growth in human capital, especially over the past three years. The long distances and substantial travel expenses are major factors that impede the increase in the number of students being trained. A local facility would be most advantageous to address this need.

Among the workshop presentations, two were especially notable, since they involved applications of synchrotron light source techniques to disciplines for which many are not aware. One involved research in paleontology, for which Kristian Carlson from Wits discussed his collaboration with Lee Berger, also from Wits, and Paul Tafforeau from ESRF. Among other things, they perform dating and craniodental investigations of the possible human ancestor, *Australopithecus sediba*, which is the much-publicized fossil remains that Berger's nine-year-old son, Matthew, discovered in 2008 while assisting his father in field work. In a presentation involving light source applications to heritage science, Leon "Jake" Jacobson from the McGregor Museum (Kimberly), discussed his applications of light



sources to study rock art, namely ancient paintings on stones. He investigates such issues as the composition of the paints and how their interactions with rock substrates contribute to the art's conservation. There is increasing worldwide interest in the use of synchrotron radiation in art and archaeology.

Finally, it is notable that Esna du Plessis and Bruce Anderson attended the workshop to represent the oil and gas company, Sasol Technology. They reported on their use of synchrotron radiation in pursuing extended X-ray absorption fine structure techniques for the study of H_2, CO and synthetic gas activation of nano iron. They also made a strong case for a local source to enable more industrial use of light sources.

In conclusion, the momentum is building rapidly within the South African synchrotron science community. SRRIC, as its representative, is committed to maintaining, and indeed intensifying, that momentum. Based upon the Strategic Plan that summarizes the outputs of the December 2011 workshop, SRRIC is looking forward to a favorable decision from DST/NRF requesting it to proceed to the development of a detailed Business Plan by June 2012 in order to move synchrotron science in South Africa to the next level of international prominence.

Sekazi K. Mtingwa is an accelerator and nuclear physicist at MIT, a founding Board Member of the African Laser Centre, and Senior Physicist Consultant to Brookhaven National Laboratory.

Highlights of a trip to the UAE and India

Sultana N. Nahar

I was invited to the international conference on Current Developments in Atomic, Molecular, Optical and Nano Physics with Applications (CDAMOP) held at Delhi University in India in December 2011. I took the opportunity to visit the United Arab Emirates University (UAEU) and the Aligarh Muslim University (AMU) in India before attending CDAMOP. I have been connected to UAEU for a few years since the female science students interviewed me for a project presentation on a modern Muslim female scientist to the general university audience.

I was treated with a very warm welcome at UAEU. Physics Chair Professor Maamar Benkraouda spent most of Thursday with me. He kept my wish for a combined audience from the male and the female campuses at the same time. Although the male and female campuses are separated by a wall and both students sit in separate classes, they share the same facilities of laboratories and libraries but at a different time. My seminar notice on applications of atomic physics to astronomy and biomedicine was posted all over the university and the audience came from Physics, Math, Medical school and English. I visited the nanoscience lab before lunch. Maamar mentioned the importance of research at UAEU and spoke of opportunities given to students to participate in research.

UAEU also offers the Ph.D. degree in physics. However, due to the teaching load, research is slow. UAEU would welcome hosting a physics conference since UAEU has the facilities for it. They would be very much interested in the networking and collaboration possibilities of a conference sponsored by the APS.

Before the seminar, I was given one hour with female students to discuss the aims and objectives of the International Society of Muslim Women in Science (ISMWS) of which I am the founder. Students were very much motivated to stay in science. Dr. Ayesha of Medical school arranged for me to make a presentation of ISMWS at a women's residency college. Most female students came without the hijab. They were as fashionable as students of any other western country. However, they did not let me take any picture without the hijab. In school, they commonly wear a black burqa. A number of them became ISMWS members. Dr. Kimberly Conners, an American English professor at UAEU and who speaks Arabic very well, told me the difficulties Arab women very often face in intellectual profession due to unsupportive husbands and fathers. The Physics Department has only one female at the teaching level, Sadiqa from Jordan, She is a lab instructor and is pursuing her Ph.D. in physics. Sadiqa, a very lively person, was given the responsibility of taking me around in Al Ain.

Meeting with female physics students at United Arab Emirates University

I donated a number of astronomy and physics books to the main library. Since I was there at the 40th National Day for the union of Emirates to UAEU, my presence and giving our own textbook "Atomic Astrophysics and Spectroscopy" (Cambridge University press) were noted to be included in their anniversary newsletter.

I was also introduced to the delegates from Sultan Qaboos University of Oman on collaborative visit to UAEU and joined them for lunch. Now I am in contact

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with the Dean Professor Saif Al-Bahry and Physics Chair Professor Sheik Rahman regarding APS membership and ISMWS.

From UAEU, I went to Aligarh Muslim University (AMU) in Aligarh, India. AMU was founded to encourage Muslims, who were far behind the Hindus and other groups in India under British rule, in higher education. AMU rose to excellence and led India in spectroscopy. However, for over the last 40 years, it has been rated much lower compared to top Indian universities. Here I gave two physics seminars in two days and one speech on ISMWS. I was asked by Physics Chair Professor Wasi Haider to teach at AMU through video conferencing. There are lots of enthusiastic students and some teachers are very dedicated in research. They will really appreciate a connection with APS. For encouragement in physics, I initiated four Physics awards, two for teaching and two for students during my visit.

Presentation of award to the best female physics student at Aligarh Muslim University in India

To introduce an undergraduate astronomy course, for which students are very much interested but not available at AMU, I contributed books to the Physics library. I also spoke on behalf of AMU at the US-India universities meeting held in Delhi where I was for the CDAMOP conference. The Indian government is aiming to build a large number of universities, 40 of which could be equivalent to the top US universities. The meeting was on the US-India collaboration on this subject.

Attending the CDAMOP conference were a large number of international scientists. Many high quality research results were presented. CDMAOP was also very well organized under the supervision of the convener Professor Man Mohan of Delhi University. I was surprised that most of the Indian participants were not APS members and unaware of some APS facilities. They would like to be part of APS very much. However, the high APS membership fee is the main obstacle. There was a big round of applause in the concluding session when I commented that I would propose at the FIP EC meeting a discount membership fee for the developing and Arab countries.

Dr. Sultana N. Nahar is in the Department of Astronomy, The Ohio State University in Columbus, Ohio and a newly elected member of the FIP Executive Committee.

Gender Issues with Chinese Characteristics: Musings on the "Women in Science" session at the OCPA7

Betty Tsang

The Seventh Joint Meeting of Chinese Physicists Worldwide (OCPA7) was held at the National Sun Yat Sen University in Kaohsiung, Taiwan, Aug 1-5, 2011. This series of conferences has been organized about every three years, chiefly by the Overseas Chinese Physics Association (OCPA). The OCPA was founded in 1991 by a group of ethnic Chinese physicists mainly from the US, mainland China, Taiwan, Hong Kong, and Singapore. Due to the politically sensitive situation in mainland China and Taiwan, the OCPA has consistently advocated the promotion of physics among ethnic Chinese physicists as the main and sole purpose of the association. Thus it was interesting to note that a lunch panel discussion on "Women in Science" was scheduled on the second day of the meeting. Could this be related to the fact that the current OCPA chair is Haiyan Gao at Duke University, the first woman President in OCPA's twenty year history?

The session was chaired by Mei Bai from Brookhaven National Laboratory. Halfway through the meeting, I counted 36 people attending the session; 17 were male colleagues. The nearly 50% male ratio was certainly the highest I have seen in this type of meeting, so much so that some late-arriving women participants peeked in and moved on thinking that it was the wrong session. In the beginning, I thought the men came only to eat their box lunch in the air-conditioned room. However, they were as active in voicing their opinions as their women counterparts during the discussions.

The opening remarks and initial comments by Mei Bai and Haiyan Gao reflected the US situation from well known studies on the gender gap in the physical sciences [1]. In the following, I mainly focus on remarks from the audience on gender issues "with Chinese characteristics".

The audience, especially those from mainland China, became indignant when they heard that some US middle school teachers would make comments such as "there is no future in science for girls". It is unthinkable to them that such teachers could exist. This really reflects the differences in the teachers' expectation of their students in the two countries. It could also be that by middle school, the students in China already have chosen their field of study, Nearly all the Chinese scientists (male and female) reported that they had supportive parents who encouraged them to pursue advanced studies in science and that "good science teachers" had been one catalyst in their choice to become scientists.

As in all gender issue discussions, how to achieve a balanced life for a woman elucidated a lot of comments. Many male participants have "precious" daughters under China's one child policy. They lamented that a successful woman scientist who does not have a balanced life would scare off young girls from pursuing science. This provoked suggestions to produce pamphlets highlighting successful women scientists as role models. One Taiwan scientist reported that a 10 minute movie made for this purpose has been successful in recruiting young girls to study science. In this day and age of multi-media, short videos posted in social media may be the way to go.

The fathers were also very active in giving out advice that girls should plan their timing in attracting supporting spouses in marriage. (To the conventional Chinese thinking, being single is not balanced! That thought also applies to men.) One father volunteered that he and his wife gave their daughter advice about her career and marriage early and that his daughter adjusted her choice of graduate school to follow the "boy". These concerns led to a frank suggestion that women should plan their personal life including marriage and childbirth, the way they plan their career. Do not leave it to chance!

There were also fatherly suggestions that physicists should learn from Mathematicians, Astronomers and Chemists where there seem to be more successful women scientists. (US statistics does not support this

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[2].) Nonetheless, most were of the opinion that it is more difficult for women experimentalists to have balanced family lives because of the need to go to the laboratory at all hours and days of the week.

Most women scientists from the US complained about their childcare situation. In China childcare in or near the work place was automatically provided under the communist government. Even in the absence of the childcare arrangements by "big brother", some women scientists in China can rely on their extended families. At OCPA7, not only did the conference provide financial support for child care, a list of local babysitters was also made available to participants with children!

When it comes to gender inequalities, most of our Chinese colleagues from the mainland do not believe that a gap or discrimination exists. It does not seem to matter that among the participants and speakers in OCPA7, the fairer sex represents much less than 20%. One senior male scientist from an institute in Beijing commented that he noticed more and more women faces in his institute in recent years. On the other hand, a woman scientist complained that the Chinese science sky is being held up by less and less women than a previous era under Mao when "women hold up half of the sky" was the politically correct slogan.

There was no time to discuss the glass ceiling. It might not be fruitful to do so if the mainland Chinese physicists were not convinced that there is gender inequity. In any case, it was time for most of us to break out of the air-conditioned bubble to face the hot humid air. Before closing the session which lasted nearly one and a half hours, the organizers agreed to compile some statistics about women representation in China for OCPA8 [3]. From the session, we can take to heart that the sincerity of the male physicists in China especially regarding the welfare of their daughters' careers may be one of the keys to remedy inequity problems.

References:

[1] An example is B*eyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering,* http://www.nap.edu/catalog.php?record_id=11741.
[2] Gender Equity, APS report, May 6-8, 2007, available online in http://www.aps.org/programs/women/index.cfm.
[3] After the meeting, the author found some statistics about women scientists in China in a talk posted online, http://www.aps.org/units/fip/meetings/upload/wu.pdf.

Betty Tsang is a Professor at the National Superconducting Cyclotron Laboratory, Michigan State University and specializes in the study of the properties of Hot Nuclear Matter & Nuclei far from stability.

Forum on International Physics Committees

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