Forum on
International Physics

APS physics

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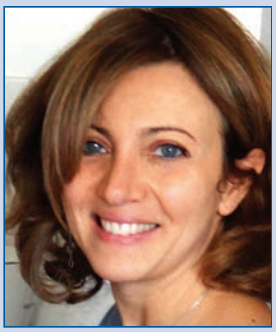
Letter from the Editor



Dear FIP Members,

Welcome to our new edition of the FIP Newsletter!

Starting from this issue, I am pleased to serve as the new Editor of the FIP Newsletter.

First of all, I want to thank again our previous Newsletter Editor, Ernie Malamud, for all his efforts during the last years and for his unbeatable enthusiasm and competency. I'm also grateful to the FIP Executive Members Cherrill Spencer, Jason S Gardner and Roy Jerome Patterson for their contributions to this issue.

We recently designed a new style for our FIP newsletter. I want to thank the APS Communication Office and in particular, Sara Conners and Nancy Bennett-Karasik for their precious help.

We hope you will enjoy the new design and we greatly appreciate if you have any further suggestions. If you are considering contributing to the FIP Newsletter with articles, please send me an email. Let us also know if there are any topics you'd like to see covered in the future.

We are looking forward to helping the members of the FIP stay better informed on our activities.

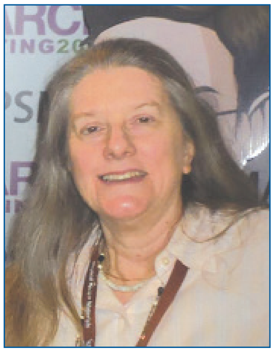
Enjoy the FIP Newsletter!

The Newsletter Editor
Maria Longobardi
University of Geneva, Switzerland
marialongobardi@gmail.com

Inside this Issue

Views and opinions expressed in articles are those of the author and are not necessarily shared by the editor or the APS/FIP.

Message from FIP Chair Cherrill Spencer



"I am a force for science" proclaims the T-shirt I bought for the recent Marches for Science and together with the Forum on International Physics Executive Committee I am trying to make our forum a force for international physics. The USA has changed a lot since I joined the FIP chair-line over two years ago; the changes originating in the USA since January 2017 have a global impact that includes the international mobility of physicists and the amount of funding for physics projects both in the USA, and outside, where USA physicists collaborate with many physicists based in other countries. Although the Executive Orders on Immigration of 27th January and 6th March have been put on hold by actions in US courts, these orders, and the general attitude of the current administration towards science, have led to a less than welcoming tone for some foreign physicists at US embassies and borders. Part of the APS's mission statement declares: "the APS strives to support physicists worldwide and to foster international collaboration". So while the Society cannot intervene in individual situations, we invite colleagues who have been affected by these executive orders or suffered harsh treatment as they entered the USA, to share their stories with us. Information can be sent to International@aps.org. (This information will only be used for statistical purposes and will be kept private.) If you are not a US citizen and are intending to visit the USA for a conference, workshop, business meeting or to work on a project, FIP recommends you read the visa information on the APS website here: http://www.aps.org/programs/international/visa/index.cfm and consult with your home institution's international office many months in advance of your planned visit to the USA.

With the help of a tenacious Program Committee, which I chaired, FIP organized 4 invited speaker sessions at the so-called April meeting, which was held in late January in Washington DC and 3 invited speaker sessions at the March meeting in New Orleans, Louisiana. We cajoled 27 speakers, 14 of whom flew in from other countries, to speak on a wide variety of topics in which they are experts. Short reports on these presentations can be found in this newsletter, together with links to the slides of many of the talks. A longer report on our best-attended session, "Physics Improves International Diplomacy", headlined by the Russian Ambassador to the USA, Sergey Kislyak, is also in this newsletter.

Our ever-popular FIP Reception was held on the 42nd floor of the March conference hotel with lovely views over the Mississippi River and downtown New Orleans. About 70 conference attendees enjoyed some tasty Cajun food and heard briefly about the activities of 5 diaspora societies: Iranian American Physicists, the Organization of Chinese Physicists & Astronomers, Ethiopian Physicists in North America, the Association of Korean Physicists in America and the Turkish Physicists Network. I also presented two of our newest APS Fellows with their certificates and pins: Christine Darve of the European Spallation Source and Sandro Scandolo of the International Center for Theoretical Physics. We accepted nominations for the 2017 FIP fellows until 30 June. Please be thinking who amongst your colleagues has initiated programs to help physicists in distant lands while maintaining a high level of physics scholarship and be prepared to nominate them in May 2018 for an APS fellowship through FIP.

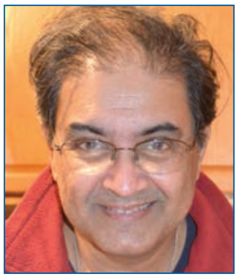
FIP sponsors and organizes two annual travel award programs. The International Research Travel Award Program (IRTAP) promotes international research collaborations between physicists in developed and developing countries; it has been going since 2004. Last year 80 applications were received and ten awards (the maximum number possible) of $2,000 each were granted. This popular travel award program is funded by donations from many of the APS units, but no donations had been received for some years and the IRTAP bank account was being depleted, so after I had run the 2016 reviewing process I initiated a campaign to raise more donations from the 13 units who had given in the past. So far 9 units (including FIP) have donated between $1,000 and $5,000 each, and I am hopeful we will eventually receive donations from all 13 units. Only members of any of these 13 units may apply for an IRTAP travel award. The second travel award program FIP organizes is for Distinguished Students (undergrads and grads) and we started the program in 2015 with a $20,000 seed-grant from the APS general fund. The travel awards are given to students from developing or under-developed countries that have their abstract for a poster or a contributed talk accepted to either the March or April APS meetings. One of the FIP members-at-large, Jason Gardner, has ably run this program for 2 years; we had 9 awardees presenting talks and posters at the 2017 meetings. The students were from Argentina, China, Ethiopia, India, Lithuania, Philippines and Turkey. We have almost used all the $20,000 seed-grant and will be looking to FIP members to donate a small amount each so we can continue this valuable Distinguished Students (DS) program. If each FIP member were to donate $5 annually we would raise the $20,000 needed annually. Look for an email from the APS or at your next annual APS membership renewal form for an opportunity to make a small donation to the DS program.

Lastly, here is an opportunity for you to provide input to the APS leadership on how the APS can better serve the international physics community (in general): a Task Force on Expanding International Engagement has been formed, the goal of that expanded engagement is to ensure the Society's long-term value to the international physics community. See Amy Flatten's article on page 5 where she seeks your input on what issues the APS should be working on, and with whom, or suggestions for new programs the APS could set up, that would benefit the international physics community. Please send your ideas by email to international@aps.org by September 30th 2017.

Physics training in India and its challenges: from schools to the university

By S. Minhaz Hossain and Surajit Sen, FIP Executive Committee Member-at-Large

Syed Minhaz Hossain



Surajit Sen

India through the ages - Civilization in the Indian sub-continent is an ancient one [1]. Revisiting the time line reveals that the civilization faced many internal and external political and religious upheavals. Regardless, Indian civilization grew on a strongly thought centric developmental path leading to rich philosophical and religious ideology [2], organized economics and political science [3], well documented mathematics and astronomy [4] incredible developments in chemistry and metallurgy and even in medicine and surgery [5]. The idea of having world class learning institutes like Nalanda [6] was conceived by the ancient Indian society, which bears testimony to the knowledge based nature of the development. Many invaders from different parts of the world came to conquer India. Some went back, some fell in love with the place and stayed on, leading to an intermixing of culture, knowledge and heritage and to give rise to the current diversity in the Indian society.

In spite of the role of religion in society, Indian science has produced world-class physicists. The names of S.N. Bose who introduced us to Bose-Einstein condensation, C.V. Raman who won the Nobel Prize for the Raman effect, S. Chandrasekhar who won the Nobel Prize (from the US) for his work on the physical processes of importance in the structure and evolution of the stars, H.J. Bhabha, the father of Indian nuclear physics and well known for his work on cosmic rays and for introducing the term "meson", J.C. Bose for his work on wireless signalling and his early use of semiconductor junctions, M.N. Saha for his pioneering work on the thermal ionization of elements which opened up the exploration of stellar astrophysics, A.K. Raychaudhuri for showing that singularity is a generic and essential feature of general relativity, a result which set the stage for the celebrated Penrose-Hawking singularity theorems, and many distinguished others reflect India's deep and time tested commitment to physics.

Today, India is the world's largest democracy with 1.3 billion people and some 30% of its population live in urban areas and the rest in rural. It is also notable that more than 50% of the Indian population are currently below 25 [7]. This may be utilised as a tremendous manpower resource but that journey is not easy. There are many universities and institutes but relatively few that can compete with the top institutions of the world. It would be years before India can reach a level where science and technology would strongly influence the lives of the majority. Yet, the country has made a renewed commitment to science and technology and has been making remarkable strides to ensure India's long-term sustenance in a technology driven and highly networked, global society. In the last fifteen or so years the Government has given special attention to science education. They have opened several autonomous institutes of national importance such as the Indian Institutes of Science Education and Research (IISERs) along with strengthening the science departments in the already existing IITs (Indian Institute of Technology), universities and other research institutes during the world year of science (2005).

The Schools — In spite of the diversity in language and culture, India maintains uniformity in its science education program starting from the elementary level to the higher educational institutes distributed over 29 states and 7 union territories speaking different languages and dialects. At the elementary and middle school levels Physics is introduced in form of natural observation. Several demonstrations on physical/natural phenomena are presented to the students to nurture their inquisitive minds. However, the degree and effort for experimental demonstrations conducted in the classes are largely restricted by the lack of infrastructural support in the government sponsored schools. Higher level of infrastructural support is available only to the schools located in the cities and urban areas.

The language of communication in the elementary schools in the rural areas is the provincial language. In the cities it is primarily English. Gradually English is adopted as the mode of communication in science for higher levels of study. During 1950s and 60s in India mathematics was not usually taught as a compulsory subject in the middle schools. But gradually, physical science and mathematics have become compulsory subjects in the secondary school syllabus resulting in improvements in the mathematical and scientific aptitudes of Indian students. From the ninth and tenth standards in the secondary schools, physics is formally introduced in its usual mathematical form via definitions, examples and simple equations. After this secondary level students are given the option to choose their specialization in humanities, sciences, business, or industrial vocational training programs. The specialization sets in at the last two years of the twelve year schooling. As education is tied to the future profession, most of the students go for a path that brings better job opportunities. The current job scenario takes a large number of students towards science subjects at this level because physics, chemistry and mathematics or biology are the required subjects for choosing engineering or medicine. Calculus is introduced in the eleventh and twelfth standards. Consequently calculus based physics is introduced at this point and this allows a formal exposure to physics. Some 20 to 30% weightage is normally given to the laboratory component aimed at providing the students with some flavour of the basics of scientific observations, recording data in an organized way, exposure to simple measuring instruments like the Vernier scale, galvanometer, stop watch, weighing machine etc. and finally to the exposure to verifying physical formulas through determination of some physical quantities. Students are evaluated both continuously as well as half yearly. The final grade is awarded on the basis of a centralized examination. The whole country does not have a single board of education. There are independent provincial education boards as well as central boards. However, the structure and the evaluation process for the science courses are about the same for all the boards.

The College and the University — Beyond the school level, country wide joint entrance exams are conducted for admission to engineering, technology and medicine courses. A large fraction of the students opt for technological and engineering studies. A small fraction of bright students choose physics and other science subjects as future career paths. The physics students get admitted to the three year undergraduate physics program at different colleges affiliated to different universities guided by the central body, University Grants Commission (UGC). This level plays the most crucial role in the upbringing of a future physicist. In the first two years of the 3 year undergraduate course the students take physics as the major subject along with two/three subsidiary subjects. This is the basic structure of undergraduate physics courses in most universities. The fundamentals of heat and thermodynamics, general properties of matter, electronics, mathematical methods, optics, electromagnetic theory, classical mechanics, quantum mechanics, statistical mechanics and nuclear physics are offered at this level. About 30% weightage is given to laboratory components containing relatively longer experiments that take about 5 hours to perform. The students are evaluated on the basis of annual examinations and a final grade and a B.Sc degree is offered at the end of the 3rd year. However, exceptions are there. IITs, newly established IISERs and a considerable number of university without affiliated colleges have adopted the semester system in undergraduate physics teaching. Some of these institutes and universities also offer B.Sc and M.Sc degrees at the end of 4th and 5th year respectively.

After completing the three year undergraduate program the students get admitted to the two year Masters' program in the universities. At this stage they are allowed to choose their specialization from amongst different subjects of theoretical and experimental physics. For admission to the graduate program (Ph.D) all India entrance exams like the National Eligibility Test (NET) are conducted. The qualified students after interviewing get admitted to the Ph.D program of different universities and institutes. So, a Ph.D student at an Indian Institute/University has a background formal training of (10+2+3+2=) 17 years in physics. These students are typically supported by Government funded fellowships.

A Work in Progress —To benchmark the standard of physics teach- ing up to 10 + 2 level, five students are selected to participate in the International Physics Olympiad every year. This program has been in place since 1996. Typically the students qualify for gold, silver or bronze medals. According to the leaders of the Indian team the students, who miss a medal, do so primarily due to weaknesses in the experimental component of the examination. This suggests a possible lack of experimental aptitude among bright physics students at this level. This shortcoming is probably an outcome of the fact that the students at this level concentrate on the preparation for different entrance examinations which do not have any experimental components. They ignore/give less importance to this part of learning physics. It is also worth mentioning that most of these bright students may have the potential to become good physicists but end up not choosing physics. Due to socio-economic forces they end up in more stable and well-paying techno-managerial professions. In 2005 the Government of India took initiative to motivate good students towards basic science courses through the INSPIRE (Innovation in Science Pursuit for Inspired Research) program offering scholarship and starting research at an early stage through performing small project works during undergraduate and masters' program in physics.

Due to limited job opportunities, a large number of physics students after completing their masters, apply for the entrance test for the Ph.D programs. As a result, conducting such entrance tests for 10s of thousands of students per year needs a tremendous infrastructural and logistical support system. Currently, the selection process does not check the students' ability to derive or prove a relation as it is fully judged by the multiple choice type answers. There is an apprehension among the teaching community that this selection process is an outcome of working convenience than quality control.

Given the geographical size, the population of the country and the tight job market worldwide, the system of physics education in India is being forced to compromise the pedagogical approach to physics education. The students are often being judged by their performance in competitive examinations which are designed to eliminate a certain number of students. As a result, students prefer to go to the coaching classes rather than the classrooms. This is a major challenge to the physics teaching community in the high schools and colleges in the country.

In this situation, a constant effort is needed to motivate the students to come to class. There is also a need for the teachers at all levels to continuously make the courses more attractive. A constant effort in Physics Education Research (PER) is needed. But PER has not yet become a major field of research for post graduate physics students in India. The reason is two-fold. There are few Institutes like the Homi Bhabha Center for Science Education under Tata Institute of Fundamental Research (TIFR) that offer a Ph.D in this field. Secondly, there are limited employment opportunities for PER graduates. After doing a Ph.D in PER, one becomes over-qualified for a job in high schools and often uncompetitive for a job in a college or a university. That said, all the major Indian institutes like the IITs are developing and uploading good quality course materials on the internet as a part of their outreach programs. These materials are often used by motivated teachers to develop their own courses. Besides the institutional efforts, Indian Association of Physics Teachers (IAPT) is working to develop the quality of teaching and learning of physics through its academic programs that are organized throughout the year. IAPT organizes workshops for the physics students at all levels as well as for the teachers all over the country. They also run talent search program at the undergraduate level to identify the top five students who are then awarded direct admission to the Ph.D program in the premier research Institutes. This talent search program has a unique feature. It selects the gold medallist not only on the basis of a theoretical examination. The top 25 students are invited to appear for an experimental examination at the final stage and hence their experimental abilities are also evaluated.

In conclusion, it is important to remember that India has a rich history, a diverse population, a great many languages and formidable poverty. Seventy years after independence from Britain, India is hard at work to educate its students in physics and has to deal with its own unique problems and opportunities. Perhaps the unsaid problem in India has to do with how many deserving students do not get the opportunity they deserve because they are not the best exam takers. We would like to hope that this article provides a sense of physics education in modern India.

Surajit received his PhD from the University of Georgia with specialization in non-equilibrium statistical physics and has been on the physics faculty at the State University of New York at Buffalo since 1993. He is the past president of the American Chapter of the Indian Physics Association, a Fellow of the APS and AAAS and a current member of FIP and CIFS.

Syed Minhaz Hossain is an Assistant Professor at the department of physics, IIEST, Shibpur. He received Ph.D, M.Sc and B.Sc degrees

from Jadavpur University, Kolkata. Minhaz was awarded a BOYSCAST fellowship by the Department of Ssience and Technology (Govt. of India) to work on nano-crystalline Silicon based 3rd generation photovoltaics at University of Trento, Italy, during 2007-08. He also received an APS Kilambi Ramavataram Fellowship from American Physical Society during 2012-13 to work on Physics Education at SUNY Buffalo. His current research interests cover the area of low dimensional silicon, carbon and their nano-composites for photonic and photovoltaic applications. Beyond mainstream research he is actively involved in developing experiments for post graduate, under graduate and school level physics teaching

S. Minhaz Hossain, Department of Physics, Indian Institute of Engineering Science and Technology, Shibpur, India, shminhaz@physics.iiests.ac.in

Surajit Sen, Department of Physics, State University of New York at Buffalo, Buffalo, New York 14260-1500, USA, sen@buffalo.edu

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The Task Force on Expanding International Engagement
New efforts from the APS International Affairs

By Amy Flatten, APS Director of International Affairs

I pleased to announce to FIP members that the APS recently has launched an important new effort, the **"Task Force on Expanding International Engagement."** The Task Force is chaired by Dr. Jonathan Bagger, Director of TRIUMF. Dr. William Colglazier, Senior Scholar at AAAS and former Science Adviser to the U.S. Secretary of State, serves as Vice-Chair.

The APS goal of expanding international engagement was a key aspiration of the Society's 2013-2017 Strategic Plan. Consequently, the APS leadership established the Task Force in 2016 to examine how APS could increase its international engagement and better serve its members, the physics community, and society at large. The Task Force will work over the next 6-8 months and provide a report and recommendations to the APS CEO, Presidential line, Council and Board of Directors.

At its recent meeting, the Task Force agreed upon the importance of hearing from the Society's members, units and international partners. Consequently, the Task Force has sought some thoughtful feedback from the FIP leadership, and international colleagues, and is eager to hear from you. Please feel free to email us at international@aps.org with your thoughts on international programs or priorities for APS, and/or ideas on some of the critical issues that you believe APS should address in partnership with other national physical societies. The FIP members' feedback will be crucial to this endeavor and I want to thank you for sharing any perspectives.

Along with the launch of the Task Force, another highlight of 2017 will be the Canadian-American-Mexican Physics Graduate Student Conference (CAM) that will be held in Washington, D.C., 17-19 August, 2017. CAM is a biennial scientific conference cosponsored by the APS, the Canadian Association of Physicists, and the Sociedad Mexicana de Física. This year, APS is also pleased to be including a delegation of graduate students from Cuba. The conference provides physics graduate students of all subdisciplines with unique opportunities to build an international network, showcase their research, and develop key professional skills. All graduate students interested in participating in CAM2017 must participate scientifically. Approximately 60 students have been selected to give oral presentations and 40 students have been selected to present their research during a dedicated poster session.

The events above are just a few highlights of 2017. Please visit our website, www.aps.org/programs/international to learn more about our ongoing programs, such as the U.S.-Brazil & U.S. India Travel & Lectureship Programs, the International Research Travel Award Program, and other exciting news. Lastly, I want to thank FIP for its wonderful partnership with the APS International Office. So many of our programs are realized through contributions of FIP's many volunteers and I want to sincerely thank you for your efforts.

Amy Flatten is serving as Director of International Affairs of the American Physical Society (APS), where she develops international scientific exchanges, collaborations, and partnerships with physicists around the globe. Prior to joining APS, she served for five years with the White House Office of Science and Technology Policy (OSTP), where she managed international S&T initiatives involving government, academia, and industry. She received her Ph.D. and M.S. degrees in Engineering Science and Mechanics from the Georgia Tech.

A worldwide constellation of theoretical Physics Centers: The ICTP partner institutes

By Sandro Scandolo, APS Fellow 2017

Based in Trieste, Italy, for more than 50 years the International Centre for Theoretical Physics (ICTP) has been a hub for scientists coming from all corners of the world. As ICTP's founder and Nobel laureate Abdus Salam used to say, it offers a safe haven to scientists coming from troubled regions of the world, providing a chance "to recharge their batteries." During the Cold War period it was one of the few places where Soviet and American physicists were allowed to meet, and after the Cultural Revolution, one of the first delegations of Chinese physicists to be given permission to visit a Western country came to ICTP.

But the world has changed dramatically since those years. China is now a leading country in research, as are Brazil, India, Turkey, South Africa and many other emerging countries. This is good news, especially now that many of the countries that used to receive ICTP support are now ready to give back and act as regional hubs for the advancement of physics. They have borrowed ICTP's model and experience to create "partner institutes" in their own regions. These international centers replicate the full range of activities that have made of ICTP a successful example of international scientific cooperation.

The ICTP South American Institute for Fundamental Research (ICTP-SAIFR), based in Sao Paulo, Brazil, celebrated its fifth birthday a few months ago with a meeting that featured talks by David Gross, Gabriela Gonzalez, and Juan Maldacena. ICTP-SAIFR was created in collaboration with the São Paulo State University (UNESP) and the Sao Paulo Research Funding Agency (FAPESP) and it is situated on the premises of the Instituto de Fisica Teorica (IFT) at UNESP, in the Barra Funda campus of the University. More than twenty activities, including schools and workshops, are being held at ICTP-SAIFR in 2017, on topics ranging from string theory and dark matter, to theoretical biology and data science. High-quality research in theoretical physics remains the main goal of the institute, which has managed to expand its faculty and attract some of the best young theoretical physicists worldwide, the latest one being Portuguese quantum field theorist Pedro Viera. Thanks to the crucial contribution of ICTP-SAIFR's faculty, UNESP has been recently recognized by *Nature* as the number one "rising star" among South-American universities.

The Mesoamerican Center for Theoretical Physics (MCTP), located in the southern Mexican state of Chiapas, was created in partnership with the local university, Universidad Autónoma de Chiapas (UNACH) and its geographical reach extends throughout Central America and the Caribbean. Most countries in this region lack PhD programs in Physics, so MCTP's main aim is to provide a preparatory master's program for talented students from the region interested in further study in physics.

A similar goal is shared by the soon-to-be-inaugurated East African Institute of Fundamental Research (EAIFR), located in a five-story building on the Kigali campus of the University of Rwanda. In 2018 EAIFR will launch the first master's program in physics in Rwanda. EAIFR has been developed in response to a need, in Rwanda and the region, for graduate training in various areas of physics, both fundamental and applied. The first Director of EAIFR, Dr. Omololu Akin-Ojo, comes from Nigeria and obtained his PhD from the University of Delaware. He was formerly the Head of Physics at the African University of Science and Technology in Abuja, Nigeria, and was appointed at the end of June 2017.

Turkey's ICTP-Eurasian Centre for Advanced Research (ICTP-ECAR) is based at the Izmir Institute of Technology and runs a regular series of conferences in its Izmir headquarters, mostly in the area of condensed matter physics.

The next and fifth ICTP partner institute will soon start hosting scientists in the new campus of the University of the Chinese Academy of Sciences on the outskirts of Beijing. ICTP-Asia Pacific will provide opportunities for advanced training, research, and education in theoretical physics and related interdisciplinary areas. It will also be an international hub for high-level conferences, schools and workshops, playing an important role in building strong, self-perpetuating communities in the Asia Pacific region.

The lecture hall of the ICTP South American Institute for Fundamental Research (ICTP-SAIFR), Sao Paulo, Brazil, during the "Bootstrap 2017" School and Workshop.

Programs at each partner institute are designed with regional needs in mind, but they all take advantage of half a century of experience in running similar programs at the ICTP headquarters in Trieste. Long-term sustainability is guaranteed by agreements that the host governments must sign with UNESCO, of which ICTP is part, to be recognized as Category 2 Institutes of the Paris-based UN organization.

The ultimate goal is to spread scientific excellence in physics and related disciplines in those areas of the world where opportunities to receive high-level training are scarce. But dreams fly high: "I would love to see someone from our institute be the first Latin-American physicist to win a Nobel Prize", ICTP-SAIFR's Director Nathan Berkovits declared in a recent interview.

Sandro Scandolo is Head of Scientific Programmes and Outreach at the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy. He chairs the IUPAP Commission on Physics for Development and is a Fellow of the American Physical Society.

International diplomacy through scientific cooperation

By Cherrill Spencer, FIP Chair 2017

A record-breaking crowd greeted Ambassador Extraordinary and Plenipotentiary of the Russian Federation, Sergey Kislyak, when he was lead-off speaker in the FIP invited session X7 on 31st January 2017 at the so-called APS April meeting in Washington DC. “Physics Improves International Diplomacy” declared the title of this session, organized by Dr. Jerry Peterson, FIP’s chair-elect, and the Ambassador endorsed this point of view. The 150 or so attendees included the 2017 APS President, Professor Laura Greene and the APS CEO Dr. Kate Kirby. Also in attendance were reporters from TASS, the official Russian news agency, Sputnicknews and Spacenews, who all reported on the Ambassador’s remarks (see reference numbers 2, 3 and 4).

Mr. Kislyak was educated at the Moscow Engineering Physics Institute and received a degree in Nuclear Physics in 1973. He went into the Foreign Ministry of the USSR soon afterwards and he has held evermore important diplomatic positions culminating in the Ambassadorship of the Russian Federation to the United States of America since 2008.

Noting that lack of knowledge about another country can lead to much distrust Mr. Kislyak pointed out an experiment that happened at the Fermi National Laboratory (in Illinois) in 1972, E36, with a contingent of 7 Russian physicists working on it and in residence nearby with their families, was the beginning of building understanding between the USSR and the USA through scientific cooperation (see reference #1 for a link to an article about E36; our past FIP newsletter editor, Ernie Malamud, was a member of the E36 collaboration). In the 45 years since E36 the relationship between our two countries has changed several times and Mr. Kislyak spoke about the unlimited opportunities for scientific cooperation that seemed to exist when the Cold War ended in the early 1990s. Although Russia was trying to integrate into the global economy an had lots of financial problems nevertheless prior to 2014 the USA and Russia had 160 agreements on scientific projects, for example with NOAA in an Arctic research station. Also the development of nuclear non-proliferation policies in the 1990s was a result of much joint work of Russian and US scientists.

The Russian Ambassador Sergey Kislyak, meets Dr Kate Kirby, CEO of the APS, before speaking at session X7.

Then in 2014 there was a worsening of political relations between Russia and the USA, for example, as Mr. Kislyak put it: the USA interfered with a democratically elected President (Victor Yanukovich) in the Ukraine, who was overthrown by protesting Ukrainians and this led to Russia annexing the Crimea in 2014 and so the USA imposed economic sanctions on Russia. All these events, including Edward Snowden being an unwelcome “guest” in Russia and a recent build-up of NATO troops along their border with Poland has led to a large decrease in scientific cooperation and the 160 agreements have reduced to two. The US Department of Energy has stopped all the joint projects since 2014. In answer to an audience member question about future cooperation with the DOE Mr. Kislyak replied he hoped it would improve; it was just 11 days since the new USA President had been inaugurated and he had not heard anything about scientific cooperation yet from the new administration. Mr. Kislyak spoke several times about Russia’s ongoing cooperation with NASA; that Russian and USA scientists and astronauts living in the International Space Station (ISS) were risking their lives together and the ISS is a good model of scientific cooperation that he hoped would continue.

With regard to the economic sanctions imposed by President Obama’s administration in response to the Crimea annexation (and increased by the charges of Russian hacking of US web servers during our Presidential election, which he did not mention) Mr. Kislyak said they were not being hurt by these sanctions, “we can live with them”, because the USA had not been their most important economic partner. It was the drop in oil and gas prices that was hurting them and they need to diversify their economy and rely less on oil and gas for revenues.

Looking to the future Mr. Kislyak praised the Russian education system which has produced a huge pool of scientists, including many physicists and mathematicians, and they wish to integrate these scientists into the global science scene. There were several Russian physicists, now working in the USA, in the audience, invited by Dr. Vladimir Shiltsev, a member-at-large of the FIP executive committee and the Past-President of the Russian-American Science Association (see more about RASA here: https://www.aps.org/publications/apsnews/201212/international.cfm). During the period 2000 to 2015 the Russian Ministry of Science and Technology increased its funding of science by 25 times. Now it is offering “megagrants” of $500,000 to $1million to foreign scientists to go to Russia and set up joint research labs, Mr. Kislyak encouraged the audience to find out about these grants.

Replying to a question about the possibility of cooperation between the two countries in the field of cybersecurity, he said: “I believe that cyberspace can be an area of interaction, rather than confrontation.” The Ambassador recalled that Moscow had already offered Washington dialogue on this topic some years ago. Another challenge both countries face is terrorism and it is better that we work on these challenges together Mr. Kislyak said.

The session speakers, APS and FIP leaders gather for a photo before the session, left to right: Vaughn Turekian, Amy Flatten, Laura Greene, Ambassador Kislyak, Cherrill Spencer, Vladimir Shiltsev, Jerry Peterson, John Boright.

The Ambassador brought his talk to a close by re-iterating that co-operation in science and technology projects is the best vehicle to build trust between countries.

Cherrill Spencer started her 45 years physics career as an experimental particle physicist, followed by a spell in industry where she learned to design magnets for a start-up MRI machine company, she returned to academia in 1988 as the SLAC National Accelerator Laboratory's only Magnet Engineer. She retired from SLAC in 2014 and is enjoying a busy retirement consulting and volunteering for FIP and other non-profit organizations.

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2. http://tass.ru/politika/3986535 (This TASS report is in Russian but an online translation program will translate it for you)
3. http://spacenews.com/russia-open-to-increased-cooperation-with-the-united-states-on-space-programs/
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Proud to be excellent! Distinguished Student (DS) Travel Support Program

Foreign students awarded for their academic and research excellence

By Jason S Gardner, FIP Executive Committee Member-at-Large

The Forum on International Physics (FIP) has sought out foreign students requiring travel support to attend the annual meetings in either March or April. Over the past two years, over 40 undergraduate and graduate students have applied for these travel monies and awardees were given between 500 and 2500 USD depending on the location of their academic institute.

Students were chosen based on their academic and research excellence, teaching and community outreach. Special attention has been given to applications from less economically developed countries or working in those countries.

Eighteen students from as far as the Philippines and Argentina have travelled to Salt Lake City, Washington D.C. and New Orleans to present their work at the APS Meetings in 2016 and 2017.

The next call for the Distinguished Student (DS) travel support program closes on 13th September 2017. (https://www.aps.org/units/fip/awards/student-seminar.cfm). Awardees will attend the APS March or April meeting in 2018 in Los Angeles or Columbus respectively, depending on their physics interest.

The DS travel program has successfully brought young researchers from distant lands to the annual APS meetings to interact with many of the worlds' leading researchers in Physics. The Forum on International Physics, with support from the Office of International Affairs at the American Physical Society, wish to continue this very successful program into the future and are discussing ways to attain funds. If members wish to support this very deserving program, please make a donation to the international program when renewing your annual dues with the society and mention the DS program specifically.

Currently, Jason is leading the Taiwanese effort in neutron scattering at the National Synchrotron Radiation Research Center. His group maintain and operate the cold neutron, three axis spectrometer at the Australian source just outside of Sydney and specialize in the study of low temperature magnetism.

Figure 1: A selection of DS awardees. Top left: undergraduate Jansen Keith Domoguen (Ateneo de Manila University, Philippines) at his poster. Both at April Meeting 2016. Bottom: Chair of FIP 2017, Cherrill Spencer (far right) and DS organizer, Jason S. Gardner (3rd from left) with April Meeting 2017 awardees. Bottom right: Maria Spiropulu (FIP Chair 2016) with Mr Sharma (Veltech University, India).

FIP sessions at the APS April Meeting 2017. A report from the FIP Chair

By Cherrill Spencer

At the April Meeting, held in late January 2017 in Washington DC, the FIP presented four sessions focused the role of physicists in international environments and society and on the international scientific facilities. The sessions addressed the role of the Physicists in International Organizations (*Session S7: The Roles of Physicists in International and Nonprofit Organizations, co-sponsored Forum on Physics and Society*), in International Diplomacy (*Session X7: Physics Improves International Diplomacy: Hear from an Ambassador, a Science Advisor and a NGO Expert*) and in the Economy (*Session U7: Physics Drives Our Economy, Connects the World, Creates the Future*). Another one, presented the deep underground facilities in South America, South Africa and South Korea (*Session Y7: Deep Science Around the World*).

Cherrill Spencer, FIP Chair 2017, provides here a brief report on the talks in the FIP sessions at the April meeting 2017, including web links to the talks and references for more details.

Session S7: The Roles of Physicists in International and Nonprofit Organizations, co-sponsored with the Forum on Physics and Society

Physics and Its Multiple Roles in the International Atomic Energy Agency (IAEA). Speaker: Charles Massey, IAEA

Dr. Massey focused his talk on nuclear security aspects and on his work on designing and building equipment to detect (illegal) nuclear materials that are moving across borders. This equipment will be developed to be used at the Radiation Portal Monitors, passive radiation detection devices currently used for the screening of vehicles, and other vectors for detection of illicit sources. There are ~10,000 Portal monitors around the world of which ~1300 are in the USA, monitoring every container coming into the USA. Dr. Massey works at The International Atomic Energy Agency (IAEA), founded in 1958 and headquartered in Vienna, Austria. It has 168 member states and 2300 professional & support staff. It has labs in Seibersdorf, near Vienna and Monaco. The IAEA has many roles and physicists could be employed in any of these roles, as for example, as nuclear watchdog (safeguards and verification), in safety & security agency or in scientific research.

See Massey's slides for much more detail: https://absuploads.aps.org/presentation.cfm?pid=13092

Science Policy: A World of Opportunities. Speaker: Anne-Marie Mazza, National Academies

Anne-Marie Mazza described the Christine Mirzayan Science and Technology Policy Graduate Fellowship. It is a 12 week program organized by the National Academies, that takes place in Washington DC, to introduce the career of science policy to recent graduates. These fellowships have a $9,000 stipend and all details can be found in Mazza's slides. The National Academies were started in 1863, chartered by President Lincoln. The National Research Council is the academies' operating arm. One of the NAS's purposes is to advise the government on science or engineering topics. They do this by organizing study committees, experts who may meet for 1.5 years and then issue a report.

Anne-Marie Mazza slides: https://absuploads.aps.org/presentation.cfm?pid=12993

Science &Technology in Development: Ending Extreme Poverty. Speaker: Michelle L'Archeveque Jones, US Agency for International Development (USAID)

Michelle L'Archeveque provided in her talk an overview of the US Agency for International Development (USAID).The USAID was founded in 1961 by President J.F. Kennedy. It partners with other agencies to end extreme poverty and promote democratic societies while advancing our security and prosperity. About 1 billion people are living in extreme poverty (live on < $1.90 per day) and they face many problems which cannot be deal with one problem at a time. USAID programs 1% of the US federal budget in over 80 countries around the world across numerous technical sectors, including global health, food security, water and sanitation, education, environment, and humanitarian assistance. In order to achieve the Sustainable Development Goals by 2030 and end extreme poverty as we know it, USAID needs to bring together diverse partners to catalyze the next generation of breakthrough innovations. That is why USAID established the Global Development Lab in 2014. The Lab focuses on leveraging the promise of science, technology, innovation, and partnership which reflects USAID's broad embrace of innovation to bring about positive change and solve some of the world's most pressing challenges. The Lab uses physicists and engineers to find solutions and they can be sponsored through various fellowships such as the Presidential Management Fellowship (www.pmf.gov) or Engineers without Borders. USAID act as the "middleman" in taking donated lab equipment from rich countries and getting it sent to developing country scientists, called "Seeding Labs".

Session U7: Physics Drives Our Economy, Connects the World, Creates the Future

Where do Foreign Student STEM graduates work after they graduate? Speaker: Neil Ruiz, George Washington University

The USA receives 21% of all the students who are studying outside their home country. Between 2001 and 2012 five million F1 visas were issued by the US Government, the F1 allows a foreign person to study in the USA. After getting their degree a STEM graduate can stay an additional 36 months for "Optional Practical Training" (OPT), 500,000 OPTs were issued between 2008 and 2015. Between 2008 and 2012 F1 visa holders brought in $35 billion to the 118 metro areas where they are clustered. Dr. Ruiz presented lots of interesting statistics about where these foreign students come from, where they are studying in the USA, what the OPTs are studying (mostly graduate degrees) and which companies hire them when they have got their advanced degrees. In regard to the Executive Order on immigration that was issued 3 days before Dr. Ruiz gave his talk, these figures are pertinent: there are about 6,000 Iranian students currently in the USA under the OPT scheme, and 60% of them are studying for PhDs, mostly in STEM subjects. Also, a significant percentage of the OPTS start new companies in the USA, and so all told foreign students are contributing to the growth of the US economy.

Neil Ruiz's slides: https://absuploads.aps.org/presentation.cfm?pid=12537 and for detailed reports on this topic go to: www.brookings.edu/foreignstudents

Bridging the Divide- Adventures of an academic entrepreneur. Speaker: Thirumalai Venkatesan, National University of Singapore and Neocera

Dr. Venkatesan told us about his life story, starting at Bell Labs and described how his invention of the Pulsed Laser Deposition Process (PLD) led him to start a company and how he integrated that company into the University of Maryland, which led to him having feet in both academia and industry. As his abstract said "Managing creative people to productize, focusing on marketing/sales and managing cash flows constituted a world significantly different from what one encounters in the academia. Survival is key and a hasty decision can be the difference between success and bankruptcy." In his talk Dr. Venkatesan discussed the various lessons learnt from the process and how one handles the challenges to eventually make an economic and societal impact.

Thirumalai Venkatesan slides: https://absuploads.aps.org/presentation.cfm?pid=13093

Wheatley Award 2017 Winner: How Physics Can Help Africa Transform, from a Problem to an Opportunity. Speaker: Neil Turok, Perimeter Institute for Theoretical Physics

Before his talk, Dr. Turok was recognized by the FIP's chair Cherrill Spencer for winning the John Wheatley Award. The award is "to honor and recognize the dedication of physicists who have made contributions to the development of physics in countries of the third world."

In his talk Dr. Turok told us about his upbringing in South Africa during the apartheid era, how his parents had worked against apartheid and been imprisoned for their efforts and how this background led him to found the African Institute for Mathematical Sciences in 2003. Its website is www.aims.ac.za. He did this following his higher education in theoretical physics in England and holding several posts in the USA and back at the University of Cambridge. His brother helped him transform an old hotel near the ocean near Capetown into a university campus and he raised money from many sources to provide full scholarships to the 50 master's students at the first AIMS as well as the operating costs. Since then he has helped 5 AIMS centers get started in Senegal, Ghana, Cameroon, Tanzania, and, most recently, Rwanda, all the while continuing with his own research in cosmology. The AIMS centers have currently graduated 1225 students from 37 African countries and they have moved into a variety of careers. Dr. Turok urged us to look at marginalized communities in the USA as well as the rest of the world, and to promote access to excellence for them.

The Wheatley Award 2017 Winner Neil Turok and Cherrill Spencer

Session X7: Physics Improves International Diplomacy: Hear from an Ambassador, a Science Advisor and a NGO Expert

Science and Technology Cooperation as an Effective Bridge for Strengthening Relations Between Russia and the US Speaker: Sergei Kislyak, Russian Ambassador to the USA.

About 150 attendees were attracted by the Ambassador's presentation. Amongst them, there were lots of members of the Russian and US press present and several articles on the Ambassador's talk have been published in the media. From his abstract: In the conditions of spiraling tensions and curtailing of many platforms for the dialogue between Russia and the U.S. scientific cooperation could play a positive role. The history of our relations shows that joint effort by Russian and American scientists has repeatedly contributed to finding solutions in difficult situations, even during the "cold war". See the longer article on page 7 of this newsletter.

From Science, Engineering and Innovation to Sustainable Development: The Path Forward. Speaker: Vaughn Turekian, US State Department

In September 2015, world leaders committed to a new 2030 Agenda for Sustainable Development, with 17 Sustainable Development Goals (SDGs) aimed at ending poverty, hunger and inequality, taking action on the environment and climate change, and improving access to health and education. The speaker Vaughn Turakian showed how science, technology and innovation (STI) underpin the achievement of all of the SDGs.

How Academies use science to enhance global security and well-being. Speaker: John Boright, National Academies of Science and Engineering

John Boright discussed the role of science in human welfare. He described collaborative programs of 150 academies of science, engineering, and medicine around the world, united to cooperate in contributing to human needs. He reviewed some relevant cooperative programs amongst academies of science, their goals being to produce common statements on major global issues, to provide advice on sustainibility and to cooperate to better connect science to the public and policy makers.

Session Y7: Deep Science Around the World

The ANDES Deep Underground Laboratory in South America: status and prospects. Speaker: Xavier Bertou

The speaker presented the project of the construction of the Agua Negra tunnel through the Andes between Argentina and Chile and reviewed the ANDES initiative, and in particular its scientifical and technological program for the next years. The construction of the tunnel will start in 2026 and it would represent a unique opportunity to build a world class deep underground laboratory in South America. Moreover, according to the speaker, it could provide a unique site for Dark Matter searches and Neutrino experiments and, due to the geoactive region location of the tunnel, it could host multidisciplinary experiments with a specific focus on Earth Science.

Bertou's slides: https://absuploads.aps.org/presentation.cfm?pid=13211

The Underground Laboratory in South Korea : facilities and experiments. Speaker: Yeong Duk Kim

The speaker focused his talk the underground physics programs in South Korea during the last 15 years. Some pioneering experiments for dark matter search and double beta decay experiments at the deep underground laboratory (Yangyang Laboratory, Y2L) were discussed. The speaker announced that, due to the limited space in Y2L, the construction of a new deep underground laboratory, capable of hosting larger scale experiments of next generation, has been proposed. The new research center in the Institute for Basic Science (IBS), Center for Underground Physics (CUP), has been approved by the government and currently the Y2L laboratory is managed by CUP. The CUP has two main experimental programs: The identification of dark matter and the Neutrinoless double beta decay search.

Kim's slides: https://absuploads.aps.org/presentation.cfm?pid=13182

The Case for an Underground Neutrino Facility in South Africa. Speaker: Zeblon Vilakazi

In his talk, the speaker, Zeblon Vilakasi, presented the need for deep underground facilities in South Africa. A feasibility study of measurements of radon in air, background gamma ray measurements, cosmic ray measurements using organic scintillators and radiometric analyses of representative rock samples for the establishment of such a facility in the South Africa was also presented.

Vilakasi's slides: https://absuploads.aps.org/presentation.cfm?pid=13191

March Meeting 2017

Open for business: FIP invited session describes new light sources

By Cherril Spencer, FIP Chair 2017

The FIP invited session at the 2017 March meeting (*X40 Division of Physics of Beams and Forum on International Physics Introduce the World's Newest Light Sources*) introduced four new X-ray light sources to the condensed matter-, bio- and chemical-physicists who attended the March meeting, so that they could evaluate if they could use the X-rays produced by these new machines in their research. The first of the five speakers was Richard Walker of the Diamond Light Source in England who gave a comprehensive "Overview of New Synchrotron Radiation and Free Electron Laser Light Sources" which included the history of light sources, starting with the chance discovery of synchrotron radiation in 1947 at a commercial synchrotron. The "brightness" of the synchrotron radiation is the figure of merit one uses to judge the intensity and collimation of the X-rays produced by the electrons in "light" sources. Walker described the progression in the types of magnets within which the electrons are forced to emit photons, from single bending magnets, to double bend achromats (DBA) to multiple bend achromats (MBA), and how the brightness has improved with these changes; the reduction in the electron beam's emittance has also led to brighter sources. The "free electron laser" (FEL) is another type of electron accelerator (linear rather than circular) that produces X-rays, using a series of adjacent bending magnets in a so-called undulator.

Five speakers and session chairs, from left to right: Paolucci, Walker, Cherrill Spencer (FIP Chair), Huang, Tavares, Ko and Tor Raubenheimer (DPB Chair).

The other four speakers described the new light sources that they direct and the types of X-rays their newly-commissioned synchrotrons and FEL produce and how to apply for beam-time. Di-Jing Huang of the National Synchrotron Radiation Research Center described the Taiwan Photon Source (TPS). It is a low-emittance 3 GeV storage ring-based synchrotron light source with a circumference of 518 m and is composed of 24 double-bend achromatic (DBA) cells connected by six 12-m straight sections and eighteen 7-m straight sections. Seven phase-I beamlines have an energy range from soft to hard X-rays and are optimized for protein micro-crystallography, low-energy excitations of novel materials with atomic specificity, spectroscopy and diffraction on the submicron and nanometer scales, scattering of coherent X-rays, and scanning nanoprobe studies that will resolve structures with a spatial resolution of tens of nanometers. All phase-I beamlines are available to users in 2017.

Pedro Fernandes Tavares of the MAX IV Laboratory, Lund University, Sweden, described the MAX IV light source which is being commissioned and marks the dawn of a new generation of storage-ring-based light sources. It is also based on a 3GeV storage ring and its use of 7-bend achromats delivers orders-of-magnitude higher performance and allows realization of groundbreaking experiments on a variety of systems and materials at the atomic and molecular levels. Tavares described the important features of the MAX IV machine including the small apertures of all the magnets and the unusual design of the vacuum chambers. The commissioning is continuing and the Tavares is confident the final design specs will be met. There are 14 X-ray beamlines available to be used to do a wide variety of experiments, such as high pressure photoelectron spectroscopy (HIPPIE) and macromolecular crystallography with a high degree of automation and remote access (bioMAX). Tavares' slides can be viewed at https://absuploads.aps.org/presentation.cfm?pid=13398.

The fourth speaker in this session, In Soo Ko, of the Pohang University of Science and Technology in Korea, described their very new free electron laser: PAL-XFEL, based on a 10 GeV electron normal-conducting linac. Its goal is to produce 0.1 nm coherent X-ray laser to photon beam users. The project was started in April 2011, the building of the 1.11km-long accelerator housing and the installation of the linac components, undulator systems, beamlines and experimental hutches was completed by the end of 2015. The commissioning of the XFEL was going well in 2016 when an earthquake followed by a typhoon three weeks later caused 2 disruptions, but the hard-working team got everything re-aligned and they achieved 0.144 nm saturation on November 27th 2016. They called in February 2017 for proposals to use some of the hard and soft X ray lines and received 22 proposals requesting 125 12-hour long shifts, which is many more than the 43 shifts available for early-beam users. Potential applications of ultra-short pulsed, coherent X-rays will be structural molecular biology and ultra-fast chemical dynamics in the range of femtoseconds. Ko's slides can be viewed at https://absuploads.aps.org/presentation.cfm?pid=13345

The last speaker, Giorgio Paolucci, in this session brought us to the Middle East and an unusual collaboration of 9 countries who have built a 2.5 GeV storage ring for producing synchrotron radiation, they are Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, Palestinian Authority and Turkey. The project is called SESAME: Synchrotron-light for Experimental Science and Applications in the Middle East. As well as providing X-rays for materials science and biochemical experiments SESAME has other objectives: (a) foster excellence in science and technology in the Middle East, (b) reverse brain drain in the region, (c) enhance regional science and technology infrastructure and (d) contribute to improved understanding among peoples of diverse backgrounds through peaceful scientific cooperation; which are all being met. SESAME has received new and recycled equipment and technical assistance from many established labs such as ALBA, CERN, ESRF, INFN and MAXIV. The commissioning of the storage ring started in late 2016 and the first stored beam was achieved on February 9, 2017, progress is being made weekly and 5 beam-lines are ready to receive various types of X-rays. Paolucci's slides can be viewed here: https://absuploads.aps.org/presentation.cfm?pid=13284

This session was informally co-sponsored with the Division of the Physics of Beams (DPB).

Physics tools for cultural heritage investigations

Roy Jerome (Jerry) Peterson , FIP Chair Elect 2017

The Session S28: *Physics Tools for Cultural Heritage Investigations*, sponsored by the FIP at the APS March meeting 2017, has been focused on the interplay between Art and Physics. The session, chaired by Roy Jerome Paterson, FIP Chair Elect 2017, hosted five speakers and showed how experimental physics techniques can provide a powerful tool to study artifacts and reveal unexpected details or structures in the common human heritage. The first speaker, Michael Wiescher, from Notre Dame, developed an innovative experimental physics methods for historical and artistic studies. He provided in his talk an overview of the methods and showed some of its recent results in investigating Cultural Heritage by means of these techniques.

You may view his presentation at http://meetings.aps.org/Meeting/MAR17/Session/S28.1.

The second speaker, Charles Falco from the University of Arizona, spoke about the insights into optics made by Ibn al-Haythem (Latinized as Alhazen or Alhacen), scientist and artist living in Cairo, in the tenth century. He demonstrated how Alhazen's studies strongly influenced the modern vision of optics and geometry, inspiring the European vision of the research.

The third speaker was Pablo Londero, a physicist working in optics at the Yale Institute for the Preservation of Cultural Heritage, he showed how to use laser based techniques to puff a tiny cloud from a valuable painting and how Raman spectroscopy can analyze the colorants, in tiny increments of depth.

Elena Guardincerri, another speaker, from Los Alamos, is currently working in a group using cosmic ray muons as probes of large objects. These penetrating (and free) particles suffer small angle scattering from nuclei, and can map out internal materials. Recently Elena is involved in an upcoming project aiming to develop muon chambers of small dimension and light enough to be mounted atop the Duomo in Florence, to investigate its internal bracing.

The final speaker, Rob Tykot of the University of South Florida, working in the field of Anthropology, is using a small, handheld X-ray source and detector for his research, to identify trace elements in large sample collections. He showed how the use of such data can track the prehistoric trade routes for obsidian, identified by source through the trace elements characteristic of the few mines for this useful material.

You may view this presentation at http://meetings.aps.org/Meeting/MAR17/Session/S28.5.

Together, these speakers described currently available experimental physics techniques, and understandings to address a wide range of artistic and historical questions, and made their methods, results, and inferences clear to an appreciative audience.

Muons around the world

By Jason S. Gardner, FIP Executive Committee Member-at-Large

Comprehending the fundamental physical properties of matter at a microscopic level enables scientists to design and develop new materials for tomorrow's applications. For these reasons, scientists are interested in studying microscopic structures and processes in a wide range of materials and travel to large international establishments to perform their condensed matter research. Free electron lasers, synchrotron light sources and neutron scattering facilities are three such centers. Like X-rays and neutrons, muons also interact with matter providing researchers with a sensitive probe of internal magnetic fields and electronic configurations of materials.

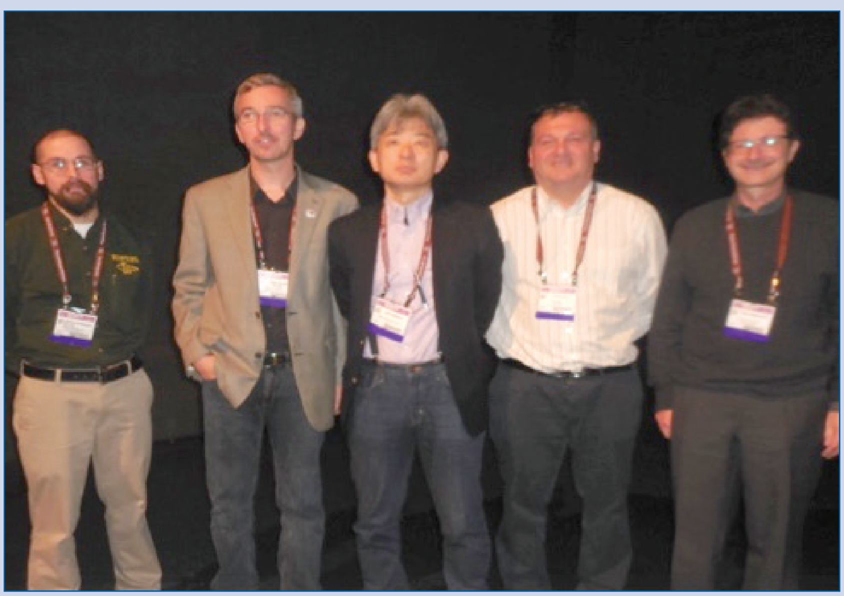
There are only four facilities around the world producing muon beams: TRIUMF in Canada, ISIS in UK, PSI in Switzerland and JPARC in Japan. These large facilities produce beams of subatomic particles, like muons, to non-destructively study different materials (magnetic, superconductor semiconductor) at the atomic level.

International facilities are of primary interest for the Forum on International Physics (FIP), being strongly focused on international scientific collaborations. For this reason, the FIP hosted, at March Meeting 2017, a dedicated session on the use of muons in condensed matter physics (Session P22: Condensed Matter Research at Global Muon Facilities)

The FIP session on muons was chaired by J. S. Gardner, from the NSRRC in Taiwan and FIP Member at Large. The session hosted five international invited speakers, Graeme Luke, Elvezio Morenzoni, Jun Suguyama, Rick (P.W.) Mengyan and Amit Keren who demonstrated how muons can be employed to study the basic properties of matter and used as support their research either applied or pure.

The first speaker, Prof. G. Luke (McMaster, Canada) introduced how muons are an excellent local probe of magnetism in exotic quantum magnets. Prof. Morenzoni (PSI, Switzerland) presented a relatively new technique developed to study thin films and interfaces. Dr Jun Suguyama (Toyota Central Research and Development Laboratories) explained how the intrinsic nature of battery and hydrogen storage materials are investigated when the positively charged muon binds with an electron (hydrogen) to form a complex known as muonium. Prof. Rick (P.W.) Mengyan from Northern Michigan University revealed how muons can be utilised in semiconductors research to understand their electronic properties. Specifically, he showed how low concentrations of hydrogen impurities, which dramatic affect on the bulk properties, can be detected as muonium. The last speaker, Prof. Amit Keren, from the Technion in Israel, spoke about his research in high temperature cuprate superconductors and how muons are elucidation the coupling between magnetic super-exchange and the superconducting transition temperature.

The FIP session on muons at the March Meeting 2017 was conceived as an introduction to muon research around the world. The session arouse the interest of the participants providing an overview of the technique and facilities chosen to represent the state of the art of condensed matter science in diverse fields.



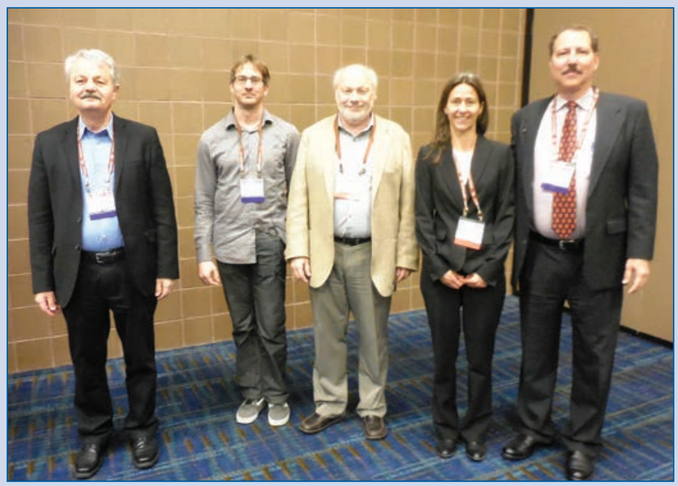
Top left: Rick (P.W.) Mengyan, J S Gardner, Jun Suguyama, Amit Keren and Elvezio Morenzoni. Top right: Graeme Luke (left) and Amit Keren (bottom right) presenting their work during the session.

Photos from the APS 2017 March Meeting and FIP reception

Meeting attendees enjoying the FIP Reception

Cherrill Spencer (in the center) with the new APS Fellows Christine Darve (left) and Sandro Scandolo (right) at the FIP reception

FIP Executive Committee Meeting at the March Meeting 2017: Maria Longobardi, Jason S. Gardner, Kate Kirby, Elisa Molinari, Elena Aprile, Roy J.Peterson, Young-Kee Kim, Maria Spiropulu, Aldo Romero, Cherrill Spencer and Surajit Sen



The invited speakers of the Cultural Heritage Investigations Session (l to r): C.Falco, P.Londero, M.Wiescher, E.Guardincerri, R.Tykot.

Awarded DS Student at the March Meeting 2017 with Cherrill Spencer (Left) and Jason S. Gardner (Right)

Christine Darve (Left) and Maria Longobardi (Right)

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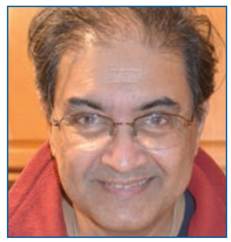

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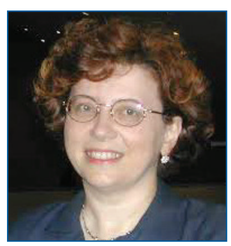

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