International Newsletter

Forum on International Physics – The American Physical Society

December 31, 2009

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View from the Chair

John W. Clark*

It is my pleasant duty to report to the FIP membership the highlights of our activities during the second half of my term as unit Chair. There are a number of ways, both regular and singular, in which we seek to advance the knowledge of physics and its diffusion by fostering cooperation and communication among physicists of all countries.

The Forum is governed by an Executive Committee consisting of the chair line (Chair, Chair-Elect, Vice Chair, and Past Chair), six Members-at-Large, a Councillor, and the Secretary-Treasurer, all elected by the membership. Each year, two new Members-at-Large are chosen to serve three-year terms and a Vice Chair is selected for a four-year term, moving up the ladder in the chair line. The Councillor, elected for a four-year term, represents the interests of FIP on the APS Council. The office of Secretary-Treasurer provides for longer-term continuity in the administration of the Forum. In addition, our Newsletter Editor, Laszlo Baksay, meets with the committee.

I can report that the recent election, with FIP Past-Chair Satoshi Ozaki chairing the Nominating Committee, has brought into the Executive Committee individuals of exceptional distinction and qualifications in international scientific affairs. On January 1, William Barletta (Fermilab) will become Vice Chair, while Giulia Pancheri-Srivastava (INFN, Frascati Rome) and Alberto F. Santoro (Cidade Universidade Rio de Janeiro) begin their terms as Members-at-Large. We welcome back former FIP Chair Herman Winick (Stanford) as our APS Councillor. Noemi Mirkin (Michigan) returns for another term as Secretary-Treasurer; we all greatly appreciate her continuing service to FIP. On behalf of the 2009 Executive Committee, I would like to express our deep gratitude for the dedication and exemplary service of those completing their terms, Satoshi Ozaki (Past Chair), Lidia Smentek and Galileo Violini (Members-at-Large), and David Ernst (Councillor).

It is noteworthy that in the past year two of our number have received special recognition for their exceptionally constructive contributions to international scientific affairs. Herman Winick has been chosen for the 2010 Sakharov Prize for outstanding leadership and achievements in upholding human rights, while Laszlo Baksay has been named to the UNESCO Basic Sciences Scientific Board.

Organization of FIP-sponsored events at the March and April APS meetings are the most visible and demanding responsibilities of the Executive Committee. In 2009, we sponsored or co-sponsored a record seven sessions, as I described at some length in the June 2009 Newsletter. Our program for the coming year is similarly ambitious and diverse. The 2010 APS "April" meeting is being held jointly with AAPT this year during February 13-17 in Washington, D.C. For this meeting we have organized four invited sessions:

- Feb. 13. Panel Discussion: Physics in Africa (Chair: David Ernst)
- Feb. 14. Panel Discussion: Policy for Physics and Science in Developing Countries (Jointly with FGSA, Chair: Galileo Violini)
- Feb. 15. Keys to Success in Global Collaborative Physics Projects (Jointly with DPF, Chair: Harvey Newman)
- Feb. 16. Panel Discussion: What Can We Learn from Physics Teachers in High Scoring Countries on the TIMSS and PISA International Assessments? (Jointly with FEd and AAPT, Chair: Cherrill Spencer)

The first of these is a follow-up on the Physics in Africa session we held at the 2009 March meeting; in the third we continue FIP's rewarding collaboration with the Forum on Graduate Student Affairs. Two more invited sessions have been arranged for the 2010 March meeting in Portland:

- March 15. Four Horsemen of the Apocalypse Redux: The Physics of Global Catastrophes and Global Countermeasures (Chair: John W. Clark)
- March 17. Emerging Scientific Powers in the East: China (Chair: Noemie Koller)

We are sure these sessions will be of great interest not only to our membership but indeed to all participants at the meeting. Please encourage your colleagues to attend our sessions and to join FIP!

As usual, our annual Executive Committee Meeting will take place at the "April" APS meeting. Frequently, we are able to arrange visits to our committee by officers of other national physics societies who are in attendance—most commonly from Mexico and Canada—for briefings on their activities and discussions of joint programs. At the Denver meeting in 2009, we were visited by Luis F. Rodriguez, President of the Sociedad Mexicana de Fisica, and Castro R. L. Fernando, President of the Sociedad Colombiana de Fisica. Professor Rodriguez also delivered a moving tribute to Marcos Moshinsky (1921-2009), whose scientific achievements and wise leadership were an inspiration to several generations of Mexican physicists. At the upcoming meeting in D.C., we anticipate a visit by Ronald Sintra Shellard, Vice President of the Sociedade Brasileira de Fisica, whose responsibilities include international scientific relations. Ron also spoke at our Physics in Latin America session in Denver.

The FIP Reception at the March meeting, co-sponsored by the APS Office of Scientific Affairs, has become an important annual event in which our members can meet one another and enjoy good food and wine in an informal setting. Formally, it is our practice to honor the APS Fellows recently elected through nomination by FIP with the presentation of their Fellowship certificates and pins. For election through FIP, a Fellow must not only meet high standards of research achievement, but must also have made very significant contributions to the advancement of science internationally. Those whose recommendations by FIP were approved for 2009 by the APS Council are Farhad Ardalan (Sharif University of Technology), Ching-Ray Chang (National Taiwan University), Karsten V. Danzmann (Max-Planck-Institut fur Gravitationsphysik, Hannover), Mamoru Fujiwara (Osaka University), Xingao Gong (Fudan University), Carlos R. Ordonez (University of Houston), Kok-Khoo Phua (World Scientific Publishing Co.), and Jorg Zegenhagen (European Synchrotron Radiation Facility). Their citations may be read at: http://www.aps.org/programs/honors/fellowships/archive-all.cfm?initial=&year=2009&nom_unit=International+Physics+%28FIP%29&institution=
We are proud to have such a distinguished group of Fellows representing FIP.

Another function of the FIP Reception is outreach to foreign members of APS, and especially to organizations of foreign nationals working at US institutions. Several expatriate physicist associations have joined us in sponsoring the March receptions. These include the Overseas Chinese Physics Association, the American Chapter of the Indian Physics Association, the Iranian-American Physicists Network Group, and the Association of Korean Physicists in America. Some of these organizations take the opportunity to recognize outstanding achievements of their members. In 2009, we welcomed to the reception a number of African physicists who participated in the Physics in Africa session. Due to the efforts of Member-at-Large Paul Gueye, Councillor David Ernst, Abebe Kebede (North Carolina A&T University), and others, we anticipate a growing association between FIP and African groups such as the North American Chapter of the Ethiopian Physics Society.

The International Travel Grant Award Program (ITGAP) is an example of a highly successful initiative of FIP and the APS Office of International Scientific Affairs (OISA). Since its beginning about five years ago, this program has made some 20 travel grants of $2000 in support of research collaborations between individual APS members and their partners in developing countries. As a result of recent efforts by Amy Flatten, Director of OISA, several additional APS divisions have made financial commitments to ITGAP, greatly enhancing its sustainability. Also administered by OISA, the newer Indo-US Travel Program provides for bilateral exchange both at the graduate-student and professorial levels. This program is well funded and increasingly attractive to both scientific

communities. FIP input in the design and establishment of such programs is ensured by the membership of our Chair, Chair-Elect, and Past Chair on the APS Committee on International Scientific Affairs (CISA). We are currently moving toward the creation, jointly with the corresponding national physics societies, of similar bilateral programs with Brazil, Argentina, and Chile. These will most likely be aimed at the level of junior post-Ph.D. researchers and junior faculty members.

The Executive Committee seeks to represent the interests of the FIP membership in supporting freedom of inquiry and expression of scientists everywhere, and their freedom to exchange ideas and travel internationally. We welcome your input on the issues of the day that are of most concern to you, so that we can respond more effectively. Such issues might include the suppression of a magazine issue dedicated to Darwinian evolution, a proposed boycott of Israeli scholars by a Scandinavian university, government-sponsored violence against university students (and other citizens) who dare to question a questionable election process, and other disturbing actions that inevitably erupt in the complex system that is our world.

I close on a related personal note. In May, having helped to organize a second Spring School on Many-Body Techniques (the first being held in Isfahan in 1991), I had the welcome opportunity of once again visiting Iran, where I have many good friends. The School, directed by Professor Majid Modarres, was hosted by the Department of Physics at Tehran University, chaired by Professor Hamid Moshfegh. The four foreign lecturers (from Germany, Italy, Russia, and the US) were greeted by a large and enthusiastic group of graduate students, equally divided between men and women, excited and inquisitive about the new concepts and methods we presented, as well as opportunities available in the larger community of physics. Significantly, I was able to meet twice with Professor Hadi Akbarzadeh, President of the Persian Society of Physics (PSI), and explore mechanisms for increasing mutually beneficial interaction and cooperation between PSI and APS and their members. Realization of these plans has been made all the more difficult by the horrific reactions of the authorities to the protest marches following the flawed election in June. Even so, these troubled times make it all the more necessary to maintain supportive and constructive communication, as well as continued scientific engagement, with our friends and colleagues in Iran. SESAME is an inspiring object lesson in what can be accomplished.

On New Year's Day, I graduate to Past Chair, with my able and resourceful colleague Noemie Koller taking over as Chair of FIP. I look forward to working with Noemie, with Chair-Elect Harvey Newman, with Members-at-Large Paul Gueye, Susana Hernandez, Marie-Louise Saboungi, and Cherrill Spencer, and with the newly elected Executive Committee members, in serving the interests of FIP members as well as APS international relations.

**John Clark is Chair, Executive Committee, Forum on International Physics, and is also Wayman Crow Professor, Washington University in St. Louis*

New 2009 APS Fellows

Our congratulations to the 2009 APS Fellows from 9 countries, nominated by the FIP:

Ardalan, Farhad

Sharif Univ of Technology, Iran

Citation: For pioneering work in applications of noncommutative geometry in string theory and gauge theories, and for promoting the participation of Iranian scientists in CERN and Middle-East programs.

Chang, Ching-Ray

National University, Taiwan

Citation: For contributions to the theory of magnetism and the development of computational approaches in spin transport, and for leadership in fostering international research and education in Asia.

Danzmann, Karsten V.

Institut fur Gravitationsphysik, Germany

Citation: For his innovation and leadership in gravitational wave detection across its full spectrum and for promoting collaboration across national boundaries.

Fujiwara, Mamoru

Osaka University, Japan

Citation: For many and continuing contributions to nuclear physics involving innovative use of high-resolution spectrometers for charge-exchange reactions, and leadership in wide-ranging international collaborations and activities.

Gong, Xingao

Fudan University, China

Citation: For innovative theoretical studies of the properties of clusters and wires, development of theoretical treatments of pressure effects on materials, and for tireless promotion of international collaborations in computational materials physics.

Ordonez, Carlos R.

University of Houston

Citation: For contributions to the effective chiral langrangian theory of the nucleon-nucleon interaction and to conformal quantum mechanics and its applications, particularly to black-hole thermodynamics, and for extensive efforts toward developing science in Latin America.

Phua, Kok-Khoo

World Scientific Publishing Co, Singapore

Citation: For tireless efforts to strengthen scientific research throughout Asia and promote international physics education and scholarly exchanges, and for enriching science and education through the World Scientific Publishing Company he founded.

Zegenhagen, Jorg

European Synchroton Radiation Facility, Grenoble, France

Citation: For his innovative contributions to the study of surfaces and interfaces with synchrotron radiation and his support of international science.

African Physicists to Launch the African Physical Society:

Aim to organize Physicists on the continent and catalyze economic development

Francis KA Allotey, Interim President of AfPS

On Tuesday, January 12, 2010, physicists from across the African continent will convene in Dakar, Senegal to formally launch the African Physical Society (http://www.africanphysicalsociety.org/). The Dakar event will include a week-long scientific conference and an official launching ceremony.

"Launching this organization is an important advancement for both science and economic development in Africa", says Professor Francis Allotey, a well-known Ghanaian physicists and the interim president of the African Physical Society. "It represents the degree to which the African physics community has grown in the last 25 years, and our efforts to take the community to a globally competitive level in the next 25 years."

Physics, which is widely touted as the most fundamental of the sciences, underpins the progress in all other branches of science and has a wide range of applications in economic development, including in health, energy research, food security, communication technology and climate change.

The movement to form the African Physical Society took shape at the 2007 Edward Bouchet-Abdus Salam Institute (EBASI) meeting at the iThemba Labs in Cape Town, South Africa. Foreshadowing the 25th anniversary of the Society of African Physicists and Mathematicians (SAPAM), the 200 participants resolved that SAPAM should become known as the African Physical Society. At the same time it was resolved to establish the African Physical Review as the official scholarly publication of the African Physical Society.

Professor Allotey points out a primary raison d'être for the African Physical Society in the latest physics research publication and citation and data: no African country, not even South Africa, ranks in the top 20 in terms of physics citations. But in each country on the top-20 list there are national and regional structures that organize physics and astronomy, as well as Science and Technology investment in general, which in turn has propelled these countries into the upper echelons of gross domestic product.

"It is unfortunate that most of the physics activities is invisible to the rest of the world," says Allotey. Yet we know that there are pockets of excellence in physics happening all across the continent. African physics needs a global on-ramp for the rest of the world so that these pockets can more easily be linked to the rest of the world".

"We intend for the African Physical Society to be a strong and unified voice for physics in Africa. We will better organize the African physics community, build better networks on the continent and beyond, be a strong advocate for more resources for physics research and education, and be mentors for students studying physics."

Included in the structure of the African Physical Society is the African Association of Physics Students. In addition, during the Dakar conference, the African Physical Society will lay the ground work for establishing the African Astronomical Society and the Optics and Photonics Society of Africa.

The African Physical Society has received the strong endorsement of the African Union. "Investment in physics and astronomy is both an important input and output of economic and social development across the continent," says His Excellency Jean Ping, the chairman of the African Union Commission. "The key to physics and astronomy leading economic development is for physicists and astronomers to organize, to advocate, to evangelize, and to push back the frontier of science and its relationship to everyday people."

About the African Physical Society

The African Physical Society (AfPS) is a non-governmental professional association. It is a registered corporation in Ghana. It is a successor to the Society of African Physicists and Mathematicians (SAPAM) which was founded in 1984. SAPAM has observer status at the African Union and has reciprocal agreements with several of the leading physics professional associations around the world. More information about the African Physical Society and the Dakar meeting is available at www.africanphysicalsociety.org.

About the African Association of Physics Students

The African Association of Physics Students (AAPS) is an African, non-political, non-governmental, non-profit-making, student-run educational association. It is comprised of students and recent graduates who are interested in physics. The purpose of the organization is to encourage physics students in their scientific and professional work in an African and an international context, as well as to promote relations between physics students from all over the world.

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The NOAA-Interdisciplinary Scientific Environmental Technology Cooperative Science Center (ISETCSC)

Solomon Bililign; Professor of Physics and Director of the Center (bililign@ncat.edu)
Keith Schimmel; Associate Professor of Chemical Engineering, Director of Education and Outreach
Yuh-Lang Lin; Professor of Physics and Energy and Environmental Systems, Center Senior Scientist

The National Oceanic and Atmospheric Administration (NOAA) funded an Interdisciplinary Scientific Environmental Technology Cooperative Science Center (ISETCSC, http://noaaiset.org) at North Carolina Agricultural & Technical State University (NCA&T) in 2006 with a budget of $2.5million per year. This is the fifth and the newest cooperative science center funded by NOAA. The ISETCSC serves as a test-bed for innovative, interdisciplinary training of underrepresented minorities in science and engineering disciplines that serve NOAA's mission goals. The Center partners seven universities, five underrepresented student serving institutions (NCA&T, City University of New York, Fisk University, California State University-Fresno, and the University of Alaska Southeast) and two large research universities (North Carolina State University and the University of Minnesota), to study weather, climate and environmental change. African American, Hispanic, and Native Alaskan students are involved in the Center. The ISETCSC involves thirty-one scientists and engineers representing a number of academic departments. Disciplines represented include meteorology, physics, chemistry, mathematics, electrical engineering, civil engineering, chemical engineering, and computer science. Scientists at NOAA's Earth System Research Laboratory (ESRL) in Boulder, CO (http://www.esrl.noaa.gov) collaborate through a cooperative agreement with the university faculty in the training of students. Scientists at NOAA's National Climatic Data Center (NCDC) in Ashville, NC (http://www.ncdc.noaa.gov) are also involved with Center activities.

In the atmospheric sciences, less than 1 percent of all doctorates went to African Americans in 2004 and only less than 4% of the recipients of BS/BA degree in geosciences are African Americans. The focus of the ISETCSC is to increase the number of graduate students from underrepresented communities in NOAA science and technology that includes atmospheric sciences. ISETCSC

accomplishes its educational goals in three ways: (a) Financial support through scholarships and assistantships, (b) Mentoring and monitoring of students that includes timely graduation and employment opportunities or continuing on to advanced degrees, and (c) Research involvement for students as early as their freshman year to help them use classroom knowledge in practice, thereby motivating them to pursue careers in Science, Technology, Engineering, and Mathematics (STEM) areas. The ISETCSC has a comprehensive educational strategy that includes informal education outreach, K-12 teacher summer workshops, and curriculum development.

One of the unique features of ISETCSC is the active involvement of NOAA scientists as members of thesis and dissertation committees of all graduate students and as seminar speakers. The NOAA scientists also work closely with ISETCSC faculty in providing short lectures and work in the labs with students. Close to 31 ISETCSC students have also spent three to six weeks in NOAA labs mainly at the ESRL and the NCDC (Fig. 1) during the last two years and they had the opportunity to be exposed to cutting-edge research developments, applications.

Figure 1: *ISETCSC students in Boulder, Colorado*

Center research is focused on three interrelated thrust areas: I - Sensor Science, Sensor Technology Development and Atmospheric Chemistry (developing remote sensing tools and measurement of climate related chemical data), II - Analysis of Observing Systems (mathematical modeling and analysis of climate and weather), and III - Information Technology Applications (methods for handling, managing, compressing and storing complicated, large data sets). Group I conducts research with the aim of developing sensing strategies, sensor technologies, and sensor packages that fill some of the existing data gaps in observation systems. A subgroup of thrust area I conducts atmospheric chemistry research to measure reaction rate constants and OH overtone initiated dissociations of organic acids and branching ratios of organic peroxy radicals. Thrust area II explores (i) the impact of weather and climate change on precipitation and hydrological variables including severe storms such as hurricanes and (ii) the role of aerosols in affecting cloud properties and the resulting impacts on climate. This group is conducting a comprehensive study combining all stages of Atlantic hurricane development and associated climatic processes that encompasses hurricane stages from the embryonic stage over the Ethiopian highlands to coastal storm surge and inland flooding in the U.S. Group III analyzes, correlates, and interprets large volumes of data from extensive networks of heterogeneous sensors that present a challenge for state-of the-art data fusion. Also, traditional data-mining techniques are adopted to discover the complex, dynamic relationships in large volumes of weather and climate data (including image data). Some of the activity in thrust III is tied to the NOAA long-range plan for enhancing the accessibility of weather and climate data and models to the general public.In the last three years,

- Over 197 undergraduate and graduate students have been trained in NOAA related sciences with 88 students at NCA&T, 95% minorities at NCA&T and 78% overall;

- Twenty-two B.S. students, twelve M.S. students, and one Ph.D. student have graduated;
- Twenty-five Ph.D. students are in the pipeline with nine at NCA&T;
- Faculty and students published over 50 refereed journal articles and made over 251 presentations;
- A Bachelor of Science program in Atmospheric Sciences and Meteorology was established at NCA&T. This is the second such program at a HBCU in the country; and
- A Concentration in Atmospheric Sciences has been developed within the Doctoral program in Energy and Environmental Systems at NCA&T.

At NCA&T, the Center has also led to the formation of several strong interdisciplinary research groups and facilities for atmospheric chemistry and physics (Fig 2), weather and climate modeling, chemical sensors, data fusion, and distributed architecture. ISETCSC aggressively pursued new collaborations and managed to successfully leverage the NOAA funding to create a sustainable Center. For example the Center has received close to $10 million in leveraged funding from NSF ONR and NASA to enhance its activities. While there have been successful collaborations in some areas of research among partner institutions, the main challenge has been the geographic diversity of the partner institutions in building a strong community.

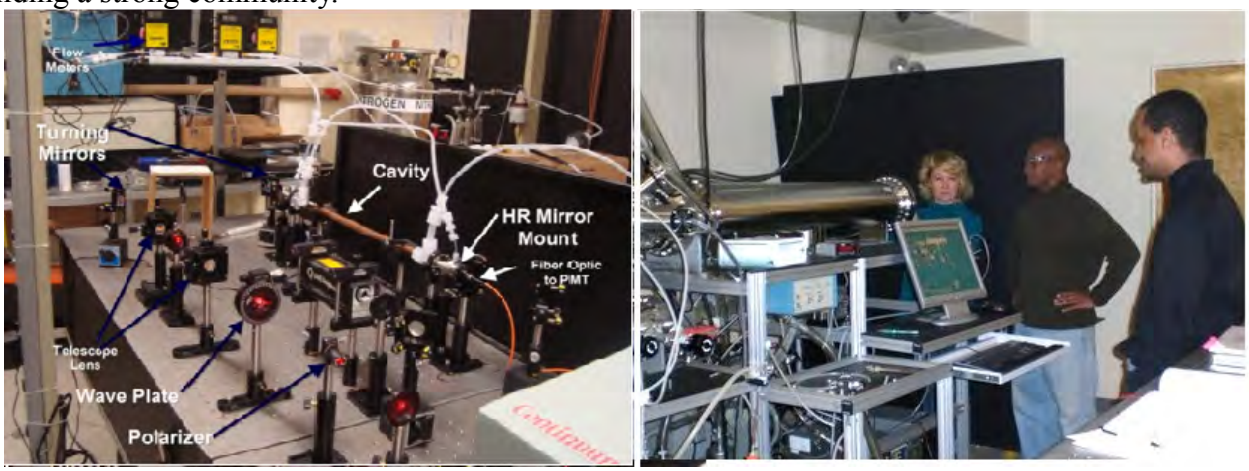


Figure 2: *Atmospheric chemistry lab at NCA&T*

Continuous evaluation and assessment is a regular practice of IETCSC. The Center is reviewed annually by two committees. The NOAA Advisory Committee (NAC) consists of top NOAA scientists and academic faculty, and the External Advisory Committee (EAC) consists of members of the industrial and government partners. The Center was also reviewed by an external review committee in April of 2009. As ISETCSC prepares for a renewal, it is preparing to conduct internal evaluation of its practices.

With a growing need to understand climate change and its impacts on air quality, economics, and society in North Carolina and the nation and with the increased emphasis on Earth Sciences in the North Carolina K-12 curriculum, the Center has the opportunity to grow into a regional Center of Excellence and position NCA&T as a leading HBCU in atmospheric research both in the state and the nation. For the Center to enhance its relevance to complex climate and weather issues, it is looking for ways to include social scientists to help in understanding the human dimension and interaction.

An Eventful year

Amy Flatten*

Introduction

This has been a dynamic year for the Society's international programs. APS strengthened its service to physicists in the developing world, created ongoing physicist exchanges with new international partners, and united with other national physical societies to launch sustainable development workshops and international student conferences. Many of our accomplishments are due to dedicated volunteers, especially from the Forum on International Physics (FIP) and the Committee on International Scientific Affairs (CISA). Consequently, it is a pleasure to share with the FIP members some of the 2009 highlights of the APS International Office.

Serving Developing Country Colleagues

A. International Travel Grant Award Program (ITGAP): The Society underscored its ongoing commitment to physics colleagues throughout the developing world through several programs. For example, the Society enabled collaborative research between APS members and 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. Awardees received up to US$2,000 for travel and lodging expenses for one month visits (or more) to an international collaborator.

B. Marshak Lectureship Awards: In addition to the ITGAP, the Marshak Lectureship award, endowed by Ruth Marshak in honor of her late husband and former APS President, Robert Marshak, provided travel support for physicists from developing nations or the Eastern Bloc that were invited to speak at APS meetings. All APS units were invited each fall to submit nominations for the Marshak Lectureship. The 2009 recipient was a nominee from FIP, Karimat El Sayed, from Ain Shams University in Egypt.

Cherryll Spencer(left),Karimat El Sayed(right)

C.Outreach for Matching Membership Program: The Society also recognizes that many developing country colleagues wish to participate in the international physics community. Oftentimes, a lack of national or regional physics organizations and a financial hardship from even reduced rate fees for APS membership, created barriers to linking with developed world colleagues. Consequently, this past year the Society heavily advertised throughout Africa its revised Matching Membership Program. Today, physicists from eligible countries may apply for full APS support through the revised Program, and connect to APS colleagues through most regular membership benefits, as well as APS News and Physics Today.

D.APS Journal Access: In addition to APS membership, developing country physicists can also enjoy free APS journal access through three different channels: 1) "on-line" access for non-profit institutions located in eligible countries; 2) email access to APS journal articles through the Electronic Journals Delivery Service (eJDS), administered by the Abdus Salam International Centre for Theoretical Physics (ICTP); and 3) CD-ROMs of APS journals distributed to academic and research institutions in developing countries (also administered by ICTP). The CD-ROMs can be mounted on a

server for use by all individuals at that institution.

In addition to the aforementioned journal access, the American Physical Society is also one of the partners in the Iraqi Virtual Science Library (IVSL) which can be found at www.ivsl.org. The IVSL is a digital portal that provides Iraqi universities and research institutes with access to millions of full text articles from over 17,000 premier scientific and engineering journals and their archives, in addition to technical content and educational resources. The Society shares the IVSL goal to help rebuild the educational and scientific infrastructure in Iraq.

E.SESAME Travel Award Program: The SESAME project--the synchrotron light source in Amman, Jordan, brings together physicists from Arab countries & Israel for international scientific collaboration. One of the challenges for the success of SESAME is building a "user community" by enabling Middle Eastern physicists to avail themselves of training opportunities. While many physicists can find local support at host training institutions, or food and lodging for the "SESAME User's Meetings," they cannot find funds to cover the travel/airfare.

The APS through the Office of International Affairs established the SESAME Travel Award Program in partnership with the European Physical Society (EPS), the UK Institute of Physics (IoP), and the German Physical Society (DPG). Here, all four physical societies each provided $5K for a total of $20K. The first round of awards were issued in 2009 and will enable Middle East physicists to attend SESAME "User's Meetings" or, other training opportunities. Moreover, it was agreed that all four physical societies will provide $5K annually for three years.

F. Workshop on "Entrepreneurship For Physicists And Engineers in Africa;" In November 2009, APS co-sponsored, along with the UK Institute of Physics (IoP), the International Centre for Theoretical Physics (ICTP), and the South African Institute of Physics (SAIP), a workshop designed for physicists and engineers from Africa interested in learning entrepreneurial skills to commercialize their scientific inventions. The workshop was held Cape Town, South Africa, and will include 60 participants from across the continent. Such an educational program is missing in many of the developing countries for scientists working in universities and scientific institutions. The objectives of the workshop were to introduce scientists and engineers to the process of innovation, generation and protection of intellectual property, technology transfer and commercialization of a product. Topics include:

- R&D and innovation management from ideation to
- Commercialization: bridging the gap
- Business plan development & capital fundraising
- Business regulations and business law
- IP and licensing
- Starting/growing a joint venture/Case studies of successful ventures

Fostering International Exchange & Collaboration

A. U.S.-India Physics Exchange Program: This past year, the Society created new international partnerships toward unique exchange programs for both graduate students and professors. A highlight

of this past year, the APS and the Indo-US Science and Technology Forum (IUSSTF) offered its first two rounds of awards to support exchanges of graduate students and professors between the United States and India. Through an MOU, the IUSSTF agreed to fund two separate and unique components proposed by APS, one for professors and another for graduate students.. APS has been awarded $108,000 for two fiscal years for the following:

1. Indo-U.S. Physics Professorship/Lectureship Program

This program funds physicists in India or the United States wishing to visit overseas to teach short courses or provide a "physics lecture series" at a U.S. or Indian university. A call for proposals is issued semi-annually by the APS, whereby the "visiting" professor and the "host" institution submit their joint proposal for the short course to be offered at either the U.S. or Indian institution. The APS has taken the lead in developing criteria for proposals and a Proposal Review Committee consisting of both APS and IUSSTF-nominated representatives select the recipients using jointly agreed upon selection criteria. Funds are dispersed through APS.

2. Indo-U.S. Physics Student Visitation Program

The United States already enjoys hosting many graduate students from India, with these students gaining a greater understanding of U.S. culture, people, as well as academics. On the other hand, while India is rapidly growing both economically and scientifically, far fewer U.S. students will gain similar first-hand experience with Indian science, culture, and people. Given this current disparity, the "student visitation" program supports more U.S. graduate student travel to India, while still enabling some Indian student travel to the United States.

This program is similar to the aforementioned Professorship/Lectureship Program in that a call for proposals are issued semi-annually. The students develop a "proposal for travel funds" in partnership with an Indian host—presumably a professor with whom their visit would be coordinated. The students however, may apply for travel funds to pursue a breadth of opportunities in physics, such as: 1) to attend a short-course, or summer institute; 2) visit with a professor in his/her field of study; 3) work temporarily in a lab; or 4) any other opportunity that the student/professor feels is worthy of travel support. As with the aforementioned Professorship/Lectureship Program, a review committee comprised of APS and IUSSTF-nominated representatives review each proposal for its merits, with criteria developed jointly by the APS the IUSSTF.

B. Beller Lectureship Awards: Along with the new exchange program with India, the Society continues to underscore its commitment to serve international physicists through the Beller Lectureship Awards. Recently expanded to provide even more opportunities, the Beller Lectureship was endowed by Esther Hoffman Beller for the purpose of bringing distinguished physicists from abroad as invited speakers at APS meetings. APS units are invited each fall to submit nominations for the awards.

C. Canadian-American-Mexican Graduate Student Conferences: In partnership with the Canadian Association of Physicists (CAP) and the Sociedad Mexicana de Fisica (SMF), the APS co-sponsored the 2009 Canada-America-Mexico Physics Graduate Student Conference (CAM2009). Leaders of the APS Forum on Graduate Student Affairs worked with their international counterparts to provide a unique conference for physics graduate students--organized by the students themselves, with mentorship from senior staff of the respective professional societies. The CAM2009 Conference was held in October

2009 in Acapulco, Mexico and broadened students' view of physics beyond their own classrooms and laboratories, promoted cooperation among international counterparts, and developed an appreciation of the different experiences of physics students from North American countries. By promoting international scientific exchanges and networking among young physics researchers, CAM2009 is expected to have a long-term impact on the graduate student attendees.

Vigilance regarding Policies Affecting International Scientific Collaboration

Throughout 2009, the International Affairs Office continued its vigilance regarding important U.S. Government policies that impact international scientific collaboration, in particular, those regarding visas and export controls. The end of 2009 is expected to bring new export control recommendations from the "Emerging Technology Research Advisory Committee (ETRAC)," a federal advisory committee established by the Secretary of Commerce in which senior members of the academic, business, military and intelligence communities provided advice on U.S. export control policy. In June of 2009, another joint statement on visa policy recommendations was signed by over 30 scientific and higher education organizations, including the APS. (APS, through the Office of International Affairs, helped to craft this statement along with representatives from AAU, NAS, AAAS, and NAFSA.) Through the International Affairs Office, the APS will continue to work with federal leaders to ensure national security concerns do not result in new regulatory regimes that unduly restrict scientific research with international colleagues.

Advocating for Human Rights

The Committee on International Freedom of Scientists (CIFS), continued its advocacy for the rights of scientists in the U.S. and around the world and responded to calls to assist those scientists in need. During 2009, CIFS has been involved in the establishment of the AAAS Science and Human Rights Coalition, a network of scientific associations and professional societies that recognize the important role that science has to play in the realization of human rights. One essential component of the Coalition is the Working Group on the Welfare of Scientists, which was established at the behest of CIFS. The Coalition was officially launched in January 2009 with representatives of over 50 scientific organizations as well as over 100 individual scientists in attendance.

Looking Ahead

During 2010, the Office of International Affairs will continue its efforts to build ongoing, sustainable programs that will help underserved physicists in developing countries, as well as implement the opportunities for new programs that have arisen during this past year. One example is:

A. <u>CISA Training/Travel Program for Developing Country Physicists</u>: In 2009, CISA had received funds to provide grants of up to $2K each to cover travel expenses for young physicists from developing countries, including graduate students and postdocs, to participate in training-workshops/schools in the United States. These grants would augment "matching commitments" by organizers of the workshops/schools who would provide the registration fees and local expenses to the recipient. CISA is developing a proposal for external funds to sustain this program beyond the initial "seed funds." In order to strengthen any proposal submitted to potential funders, CISA has spent 2009 securing "letters of intent and/or expressions of interest" from U.S. schools/workshops that indicate--if this travel training program were established—their schools/workshops would provide the aforementioned matching funds. CISA will leverage the commitments from above for its efforts to secure external funds to sustain this program beyond 2010.

B. <u>Partnerships for Sustainable Development Initiatives and International Program Development</u>: As mentioned above, during 2009, the APS partnered with other national physics societies toward a number of international initiatives. It is our intention to continue to do so in 2010.

For example, plans are already underway to work with the UK Institute of Physics and ICTP toward another Entrepreneurship workshop for developing country physicists and engineers to be held in May 2010.

Again, so many of the above activities and accomplishments can be attributed to the ongoing collaboration between the APS International Office, and the members of the Forum on International Physics. I look forward to working with you in the upcoming year, and stand ready to promote our shared international interests.

Science and a World in Transition

Selected memories of an international science bureaucrat

(Episode 6-7)

Irving A. Lerch*

Going, Going, Going International —

In 1991 I was preparing to take a sabbatical leave and had planned to join a colleague—the dean of physical sciences at the University of Rome—to share in setting up a radiofrequency biophysics lab. However, the NYU Provost asked members of the senior faculty to forgo their sabbaticals owing to financial exigencies then looming over the University or to accept reduced stipends while on sabbatical.

Fortuitously I received notice of the intention of the American Physical Society to organize a new international program and a call went out for nominees to develop and head it up. I offered to set up the program while on sabbatical if APS and NYU shared my support and as '92 dawned, I opened shop in APS headquarters on 45th Street in Manhattan, across the street from the UN and not far from my NYU offices. And while I was unhappy to forego a delightful year in Rome, the world beckoned.

Also by 1991, the USSR had collapsed and the overriding question was: What can we do to avoid a total breakdown of former-Soviet Union (FSU) physics and how do we prevent the weapons specialists from offering their skills up to competitive bidding by rogue states and terrorist groups? These were big questions. At the same time, smaller questions arose: What sort of relationship should we forge with others–especially Europe? How do we service the special needs of the very large number of foreign scientists in the US—many of whom came as students and stayed to contribute to the scientific productivity and commercial development of US industry? The days when US science and engineering dominated the world and provided most of the intellectual innovation were over. We were now the consumers as well as the progenitors of new knowledge and we needed all the brain-power we could find.

At the time I joined the Society, the APS had decided that the first priority would be a relief program for FSU physicists. By that time, the almost total collapse of FSU science had unleashed the first tsunami of immigrant scientists coming into the US. We obtained grants to provide research journals and support a number of institutional summer and winter schools—the traditional mechanism used by Soviet scientific institutions to maintain contact and share technical information. Because of the government collapse in Russia, scientists were no longer receiving pay or benefits and an urgent need was money for food and rent. We began identifying physicists to receive one-time emergency grants of $500. More money was donated by private foundations and finally by the financier, George Soros, who had established philanthropies to encourage democratic reforms throughout the Warsaw Pact.

By 1993, as we moved our headquarters from New York to just outside Washington, DC (to be closer to the nexus of power), almost $2 million was being put in circulation to provide emergency grants. It became clear that events were moving rapidly and a distinguished MIT colleague, Herman

Feshbach and I went to Moscow to negotiate with the then Deputy Premier, Boris Saltykov, to assure a continuing, legal, untaxed distribution of subsidies as moneys became available. This brought us into contact with Soros' Moscow Renaissance Foundation and enabled us to set up banking offices in Moscow to distribute cash delivered by holding banks. We developed a network of North European banks with satellite offices in Moscow. Soros was so taken by this success that he committed an additional $100 million to a larger effort to salvage all of the natural sciences. We helped establish the operating framework for what became the International Science Foundation. Ultimately, the ISF distributed more than $140 million in short-term emergency grants, long-term grants, fellowships and professorships, internet connectivity, journal distribution and academic travel.

This gave the US government time to set up sustained programs to secure Russia's inventory of nuclear fuel and armaments depots. Eventually the US joined with Europe and Japan to establish programs in Russia and Ukraine to convert weapons research to peaceful pursuits.

The Emerging Scientific World Order--

We attempted to strengthen scientific ties between US and Chinese physics communities in the wake of the breach suffered during the Tiananmen Square massacre in June, 1989, which disrupted an important exchange program initiated by the US physics community to retrain physicists lost during the Cultural Revolution. A mission was undertaken by Burt Richter (a Nobelist and Director of the Stanford Linear Accelerator Center), Kumar Patel (the inventor of the gas laser and numerous innovations), and myself. The purpose of the mission was to put in place a mechanism for developing a mutually beneficial collaboration between US and Chinese physicists and to put on record US concerns for the human rights of physicists in China.

While in Beijing I was given permission to visit a distinguished dissident, Professor Xu Liang-Ying (who had introduced modern relativity and quantum physics to Chinese universities). He and his wife were being held under house arrest in retaliation for his open criticism of the Chinese government's repressive and undemocratic policies. Our discussion was monitored by an official from the Chinese Academy of Sciences so I was careful to emphasize the concern of the US scientific community for his safety and well-being.

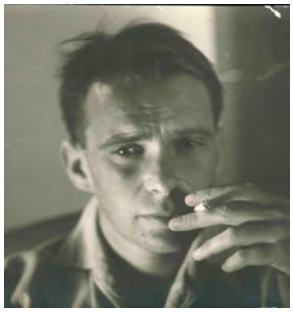
The APS Council barely approved the MOU after objecting to the fact that no notice of human rights was acknowledged in the Memorandum. The joint commission did succeed in organizing two workshops for 1994 and 1995, but at the end of 1995, the MOU was not renewed, largely owing to a lack of progress on human rights. By then, many of the dissidents that we had supported had been able to either escape or were released into exile. But more to the point, the Chinese scientific establishment had moved into the international mainstream big time.

In 1992, the European and American Physical Societies (EPS and APS) agreed to hold a workshop to develop a long-range plan aimed at assisting physical societies and physics institutions in East-Central Europe (ECE), the Baltic States and the FSU. Then in the fall, we held a series of meetings with our colleagues in Latin America to strengthen and formalize our many links with these intellectual communities. These activities were tacit recognition of the fact that the world had undergone a fundamental transformation since the end of WWII when the US produced 80% of the world's scientific output. Today, fully one third of our research faculty and half of our graduate students come from abroad—mostly from Asia but increasing numbers from the larger nations of Latin America. Two-thirds of all scientific articles published in American journals are submitted by foreign researchers. Our scientific competence and the foundation of our prosperity and national defense are now very much dependent on our access to information developed by foreign scholars educated in foreign schools.

**Irving Lerch has also been First Officer, International Atomic Energy Agency, Department of Research and Isotopes*

Bruno Touschek and the birth of electron-positron Collisions

Luisa Bonolis (Gruppo di Storia della Fisica, AIF)
Giulia Pancheri (INFN Frascati National Laboratories)


B. Touschek

On November 11th, 1974 the simultaneous announcement of the discovery of the J/Psi by Burt Richter and Sam Ting [1], confirmed three days later by the Italian physicists in Frascati, signaled the beginning of a new era in particle physics. The discovery, at a traditional proton machine in Brookhaven National Laboratory and at two electron-positron colliders, SPEAR in SLAC and ADONE in Italy, showed that matter-antimatter collisions in a laboratory setting could compete with the traditional proton machines and were a formidable tool to probe the quantum vacuum and discover new particles.

The road to matter-antimatter collisions in the Laboratory had started thirty years earlier, when two European scientists, the Norwegian Rolf Wideroe and the Austrian born Bruno Touschek, had met in war ravaged Germany, and had exchanged ideas and books about the theory of the betatron. It is Wideröe [2], who first thought of having two beams of particles collide head-on and even patented his idea in later years. He discussed the matter with Touschek, during one of their meetings, but it was Touschek who, after moving to Italy at the beginning of the 1950s, applied the idea of the kinematic advantage to beams of particles of opposite charges, and actually proposed and built, in Frascati, the first electron-positron storage ring, named AdA, the Italian acronym for Anello di Accumulazione. The story of this achievement is a good illustration of how physics ideas start and develop, and Touschek's survival in Germany during the war is one more tale of courage deserving to be known.

Bruno Touschek was born in Vienna, in 1921 from Franz Joseph, an officer in the Austrian army, and Camilla Weltmann, who belonged to a Viennese Jewish family prominent in artistic and intellectual circles like the Vienna Secession and the Wiener Werkstätte. Camilla Weltmann died young, but Bruno kept frequent and intense relations with his maternal family, in particular with one aunt who lived in Italy and had a villa on the Alban hills southeast of Rome. In the fall of 1938, Touschek's life was shattered, when he was expelled by all Viennese Lyceums, together with every other young persons of Jewish origin. But, like most of them, he still took his final exams privately and in fall 1939 registered to study philosophy, i.e. physics, at the University of Vienna. Not for long though, since, in June 1940, also university life closed for him. He continued his studies, at the home of Paul Urban, then a young assistant professor, with books borrowed from the university library, and read Arnold Sommerfeld treatise on "Atombaum und Spektrallinien". It is through this book that Touschek came to first learn electrodynamics and then to know Arnold Sommerfeld, whose protection allowed him to move to Germany, in early 1942, when life for Vienna Jews became too dangerous.

In Germany he moved between Berlin and Hamburg, attending classes at the University without being registered, and keeping some odd jobs. One of them was with a small electronic devices firm, whose director was also editor of a scientific journal, Arkiv fur Electrotechnik. Through him, Touschek heard of Rolf Wideröe's proposal to construct a 15 MeV betatron. At that time, D. W. Kerst and R. Serber had already put into operation a 2.3 MeV betatron at the University of Illinois, so that Wideröe was to build for the German authorities the first European betatron, later appropriated by the Allied forces and somehow lost. Thus Bruno Touschek and Wideröe met and when Touschek was finally discovered by the Gestapo and put to jail as a spy, Wideröe would go to visit him, bring him books and

continue discussing about the physics and their ideas. Wideröe, in his biography, remembers bringing food and cigarettes and a copy of Heitler's "Theory of Radiation". On such book, it is said that Touschek wrote, with invisible ink, a short note on "Radiation damping in betatrons" [3]. These short notes indicate clearly the intellectual developments and studies which would lead later to the proposal to build an electron-positron collider and to a program of administering radiative corrections to high energy electron positron scattering. But all this was yet to come. In early 1945, while the Allied were progressing through Europe, Touschek met the most dramatic point of his life. We have his direct account of a famous incident in a letter he wrote to his father shortly after the war ended. We have extracted some details, as follows.*

"1945, June 22nd
Dear parents, … I have not received any news from you for a very long time…[I shall now give you] a brief update about what happened to me… After 3 weeks in prison in Hamburg, where I was because of suspected espionage, the prison was evacuated …[and] all the (200) prisoners were put in a long line towards Kiel [concentration camp]. In front of us, behind, and on the sides, marched the SS guards. Near Hamburg… I fell to the ground … and the guards pushed me in the gutter, near the
*A full translation of the letter, which is in German, will be published elsewhere.
road, and shot me. One shot went through my left ear, the other through the lining of my coat. …[After they left me for dead] I went to the hospital, and was again made a prisoner and sent to Hamburg from prison to prison. This lasted about four weeks."

After the war, Touschek went to University of Göttingen to obtain his diploma, and then, for his final education, to Glasgow, where he obtained his doctorate in 1947. In Glasgow there was active work in designing and constructing a synchrotron, as shown in the accompanying cutting from a local Glasgow newspaper. This experience established Touschek's subsequent and seminal work of all the subsequent years.

The Home Of The Synchrotron

Prof. Philip Dee (extreme right) pointing out to fellow research workers features on a model of the new synchrotron block to be built at Glasgow University. Others are (left to right) Mr. A. C. Robb, Dr. S. C. Curran and Mr. B. Touschek.

NO DANGER TO CITY FROM A-PLANT

"THERE will not be the slightest danger to anybody in the neighbourhood of this machine. I want to make that clear because I know there are a lot of stories going around."

Thus Professor Philip Dee, leader of the research team which will probe atom secrets at Glasgow University, yesterday scotched alarmist rumours which have sprung up following the announcement that a giant 300-million volt synchrotron producing 30 million volt X-rays is to be installed there.

The tall, dark, sparely-built Professor added: "Long before anybody outside would be affected in the slightest degree, those inside would be dying like rats. So people outside are certainly very safe—we are not going to kill ourselves, and we are going to be up against the thing."

The Professor was showing reporters a model of the new building which will house Britain's biggest synchrotron.

The machine will be sunk in a basement 20ft. below ground level, with 5ft. concrete slabs separating it from a main hall and research rooms above.

More important to the physicists than the synchrotron itself will be the beam produced, which will travel through a tube to a beam room into which targets will be shot through slits to test matter's reaction to 30-million volt X-rays.

BENEFITS

What are likely to be the benefits to society and medical science? His answer:

"It would be a very bold person who said what would be the consequences of understanding the structure of the nucleus.

"We physicists are not indifferent to what comes out of it. But it is best that things should be allowed to grow out of it naturally, rather than that we direct our efforts to a specific end."

When in the early 1950's in Frascati, near Rome, an electron synchrotron was designed and finally commissioned a few years later, Touschek, who had moved to Rome in 1953 with a University position, was ready and prepared to join the work taking place in the newly built National Laboratory. The Frascati Synchrotron started to work in the fall of 1959, and it is at this point that Touschek put forward an "unthinkable idea", namely to forget the electron synchrotron, one of the most powerful of its kind in the world (the other two being at Cornell and at Caltech), and transform it in a single ring for observing collisions between electrons and positrons. The concept of center-of-mass collisions had been pursued by the American and Soviet counterparts all throughout the late 1950's, but the concept was applied to beams of protons circulating in two different rings or two electrons against electrons, as in the case of the Princeton-Stanford group, who, with Gerald O'Neill and Burt Richter, was building an electron-electron two-ring collider. Touschek's speculations emerged during discussions following a seminar delivered at the Physics Department in Rome in the fall of 1959 by Wolfgang Panofsky, at the time the Director of HEPL at Stanford. Touschek's outstanding idea was that, because of symmetry, opposite charges can be stored in one single ring, and made to collide head-on, provided that their masses are equal. Touschek's also favored electrons over protons, as the first appeared to him as "gentle probes" opposed to the "messy physics" generated by protons. Thus one needed positrons to collide with electrons. "*The challenge of course"* as Touschek writes in one of his notebooks,"*consists in having the first machine in which particles which do not naturally live in the world that surround us can be kept and conserved* ".

Touschek presented his ideas at a Laboratory meeting in February 1960. His proposal of converting the synchrotron was obviously rejected, but a decision was taken for the construction of a small storage ring to prove the feasibility of electron-positron collisions, and, at the end of 1960, AdA had been built. The small AdA had a 65 cm radius and a beam energy of 250 MeV. A first stored beam of few electrons was obtained at the end of May 1961, using the Frascati Electron Synchrotron as an injector, while electron-positron collisions were actually only observed at the beginning of 1964 when AdA was shipped to France at the "Laboratoire de l'Accelerateur Lineaire" of Orsay, near Paris, where a high intensity linear accelerator was available.

AdA showed the feasibility of electron-positron collisions, and opened the way to higher energy and luminosity. Soon after it was built, in the USA, Soviet Union and Europe, proposals to built more powerful colliders, with higher energy and higher luminosity were put forward. The road which led to some of the most important discoveries of the Standard model had been opened.

[1] Samuel C.C. Ting, From Nobel Lectures, Physics 1971-1980, Editor Stig Lundqvist, World Scientific Publishing Co., Singapore, 1992.
http://nobelprize.org/nobel_prizes/physics/laureates/1976/ting-lecture.pdf
[2] The life of Rolf Wideroe, 1994, DESY, Edited by Pedro Waloschek.
[3] E. Amaldi, The Bruno Touschek Legacy, CERN 81-19, 23 Decembre 1981 and L'eredita' di Bruno Touschek, Quaderni del Nuovo Cimento, SIF, Vol. V, 1982.

The 2010 African School of Physics

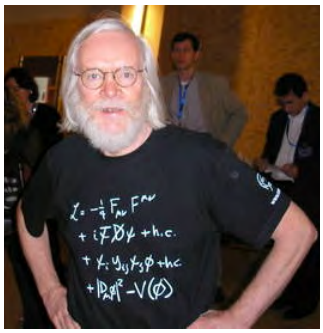
Dr. Steve Muanza
Marseille Particle Physics Center (CPPM)
National Center for Scientific Research (CNRS)
National Nuclear and Particle Physics Institute (IN2P3)

Physical sciences in Africa will enter a new arena in the summer 2010 with the launch of a *Biennial School of Fundamental Physics and its Applications in Sub-Saharan Africa* labeled African School of Physics (ASP2010). This first historical event will be held on August 1-21, 2010 at the National Institute for Theoretical Physics (NITheP) in Stellenbosch, South Africa. Lecturers and tutors, mainly from Western Europe and from the USA, but also from South Africa, and students mainly from sub-Saharan Africa will gather for three weeks of lectures, discussion sessions and hands-on labs. About 50 students are expected to attend this first historical event from the following geographical locations: about 25 from South Africa, 15 from other sub-Saharan African countries, 5 from northern Africa, 3 from the USA and 2 from Europe.

The school is free of charge for the students from sub-Saharan Africa: full travel support will be provided, along with accommodation and food expenses. It is meant to give students interested in fundamental physics the opportunity to: (i) benefit from high-quality lectures in this field; (ii) be exposed to cutting-edge technologies utilized in large experiments of subatomic physics (i.e., GRID computing, fast and radiation-hard electronics, high precision mechanics, laser physics, cryogenics, medical imaging, hadron therapy …); and (iii) develop contacts with lecturers, tutors and other students at ASP2010 as a first step to enable large international scientific networks.

- **Organization**

The project was initiated by two high energy physicists: Steve Muanza (CNRS-IN2P3/CPPM, France) and John Ellis (CERN). An International Organizing Committee was formed in 2007 that regrouped researchers from CERN (Switzerland), CNRS-IN2P3 and CEA-IRFU (France), ICTP (Italy), FNAL and JLAB (USA), the University of Louvain (Belgium) and the University of Santiago de Compostela (Spain). The creation of a Local Organizing Committee followed in 2008 mainly constituted of physicists from South Africa: the universities of Cape Town, Johannesburg (Witwatersrand and Johannesburg) and the iThemba Laboratory for Accelerator Based Science (iThemba Labs).



Left panel - From left to right: Dr. Zeblon Vilakazi (Director, iThemba Labs), Mrs. Anne-Marie Ferrer (CNRS) and Dr. Steve Muanza (CNRS-IN2P3/CPM) during a visit to prepare ASP2010 at the iThemba Labs. **Right panel** - Dr. John Ellis (CERN).

- **Funding**

In addition to support from the institutions listed above, the school obtained additional contributions from NITheP and the South African CERN consortium (SA-CERN). Discussions with other institutions and governmental agencies as well as private sponsors have been also engaged to leverage the cost.

- **Scientific program**

The school's program consists of four main parts: Theoretical aspects of Particle, Nuclear, and Astroparticle Physics; Experimental aspects of the above-cited disciplines; Computational aspects of the above-cited disciplines, including an introduction to GRID computing; and Accelerator Physics and Technological Applications of accelerators and detectors instrumentation, including Medical and Laser applications. In addition to the plenary lectures, the program also includes:

- *Discussion sessions*: where the students, divided into small groups, will have the opportunity to ask questions about the lectures. The presenter may propose to solve a couple of short problems to illustrate the lectures. These sessions will occur in the proportion of about 1 hr for 4 hrs of plenary lectures.
- *Computer labs*: where paired students will run some software illustrating the lectures (particle event generators, data analysis framework, GRID jobs submission …).
- *Instrumentation labs*: coupled to a visit of the iThemba Labs facility, interested students will have the opportunity to run very small scale experiments at this facility.

From left to right: Dr. Steve Muanza (CNRS-IN2P3/CPPM), Mrs. Anne-Marie Ferrer (CNRS) and Pr. Jean Cleymans (University of Cape Town).

- **Application process**

The school is designed for undergraduate physics students who have completed and passed at least 3 years at a university (typically BSc) and graduate students involved in a PhD thesis. Pending on availability of funds, young post-doctoral fellows may also be considered. All the lectures and pedagogical material will be exclusively taught and written in English. It is indispensable that the students have a good knowledge of fundamentals physics (classical physics as well as basic notions of special relativity and quantum mechanics) and solid foundations in mathematics (algebra, geometry, calculus, statistics and probabilities). Additional knowledge in computer programming (C, C++, Linux OS, shell or Python scripting) will constitute valuable assets for the accepted applicants, even though these are not explicit prerequisites to apply.

ASP2010 website http://cern.ch/AfricanSchoolofPhysics	**Contact** Dr Steve Muanza CPPM Marseille, CNRS-IN2P3 163, Avenue de Luminy. Case 902 13288 Marseille cedex 09 FRANCE e-mail: muanza@in2p3.fr
Registration Send a CV and a letter of motivation at ASP2010-Registration@cern.ch (PDF format is preferred). A letter of recommendation can be added, but this is not mandatory.	

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