11:15AM B2.00001 ASP2012: Fundamental Physics and Accelerator Sciences in Africa CHISTIN DARVE, European Spallation Source — Much remains to be done to improve education and scientific research in Africa. Supported by the international scientific community, our initiative has been to contribute to fostering science in sub-Saharan Africa by establishing a biennial school on fundamental subatomic physics and its applications. The school is based on a close interplay between theoretical, experimental, and applied physics. The lectures are addressed to students or young researchers with at least a background of 4 years of university formation. The aim of the school is to develop capacity, interpret, and capitalize on the results of current and future physics experiments with particle accelerators; thereby spreading education for innovation in related applications and technologies, such as medicine and information science. Following the worldwide success of the first school edition, which gathered 65 students for 3-week in Stellenbosch (South Africa) in August 2010, the second edition will be hosted in Ghana from July 15 to August 4, 2012. The school is a non-profit organization, which provides partial or full financial support to 50 of the selected students, with priority to Sub-Saharan African students.

1 on behalf of the ASP2012 organizing committees

11:51AM B2.00002 The African Laser Centre: Transforming the Laser Community in Africa, SEKAZI MTINGWA, Massachusetts Institute of Technology — We describe the genesis and programs of the African Laser Centre (ALC), which is an African nonprofit network of laser users that is based in Pretoria, South Africa. Composed of over thirty laboratories from countries throughout the continent of Africa, the ALC has the mission of enhancing the application of lasers in research and education. Its programs include grants for research and training, equipment loans and donations, student scholarships, faculty grants for visits to collaborators’ institutions, conferences, and technician training. A long-term goal of the ALC is to bring a synchrotron light source to Africa, most probably to South Africa. One highly popular program is the biennial conference series called the US-Africa Advanced Studies Institute, which is funded by the ALC in collaboration with the U.S. National Science Foundation and the International Center for Theoretical Physics in Trieste. The Institutes typically bring about thirty faculty and graduate students from the U.S. to venues in Africa in order to introduce U.S. and African graduate students to major breakthroughs in targeted areas that utilize lasers. In this presentation, we will summarize the ALC achievements to date and comment on the path forward.

12:27PM B2.00003 SESAME — A light source for the Middle East†, HERMAN WINICK, SLAC National Accelerator Laboratory — Developed under UNESCO and modelled on CERN, SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East) is an international research centre in construction in Jordan, enabling world-class research while promoting peace through scientific cooperation. Its centerpiece, a new 2.5 GeV 3rd Generation Electron Storage Ring (133m circumference, 26nm-rad emittance, 12 places for insertion devices), will provide intense light from infra-red to hard X-rays. The Council (Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, Palestinian Authority, Turkey), provides the annual budget. Concrete shielding is complete, and a staff of 21 is installing the refurbished 0.8 GeV BESS Y I injector system, a gift from Germany. The facility can serve 25 simultaneous experiments. Beamline equipment has been provided by Daresbury (UK), the Helmholtz Assoc. (Germany), the Swiss Light Source, LURE (France), the Univ. of Liverpool, Elettra (Italy) and US labs. Jordan has contributed $3.3M, in addition to a building and land. The EU has contributed $4.8M. Commitments confirmed by Members look set to provide most of $35M needed to complete construction of the ring and 3 beamlines. A training program has been underway since 2000. See www.sesame.org.

† Support by the Office of Basic Energy Sciences, Office of Science, US Department of Energy

1:03PM B2.00004 Marshak Lectureship: The Turkish Accelerator Center, TAC, OMER YAVAS, Accelerator Technologies Institute, Ankara University, Ankara, Turkey — The Turkish Accelerator Center (TAC) project is comprised of five different electron and proton accelerator complexes, to be built over 15 years, with a phased approach. The Turkish Government funds the project. Currently there are 23 Universities in Turkey associated with the TAC project. The current funded project, which is to run until 2013 aims

1. To establish a superconducting linac based infra-red free electron laser and Bremsstrahlung Facility (TARLA) at the Golbasi Campus of Ankara University, (a) To establish the Institute of Accelerator Technologies in Ankara University, and

2. To establish the Technical Design Report of TAC. The proposed facilities are a 3rd generation Synchrotron Radiation facility, SASE-FEL facility, a GeV scale Proton Accelerator facility and an electron-positron collider as a super charm factory.

In this talk, an overview on the general status and road map of TAC project will be given. National and regional importance of TAC will be expressed and the structure of national and international collaborations will be explained.

† On behalf of TAC Collaboration

1:39PM B2.00005 Andrei Sakharov Prize Lecture: Physics and Freedom in Ethiopia, MULUGETA BEKELE, Department of Physics, Addis Ababa University — I will highlight my forty years involvement in physics education and research in Ethiopia and draw lessons that could be learnt from it.

Tuesday, February 28, 2012 11:15AM - 2:15PM


12:27PM J27.00003 Future Trends ad Issues in Nuclear Power, RICHARD LESTER, Massachusetts Institute of Technology — No abstract available.
interaction with other human rights organizations, and touch upon some venues through which the community can engage to help in this noble cause.

impetus that led to such an advocacy, the methods employed then and how they evolved to the present CIFS responsibility “for monitoring concerns regarding

function as scientists” and by 1980 it was established as an independent committee. In this presentation I will describe some aspects of the early history and the

three families of quarks, the neutrinos have a unique character. As neutral particles, it is possible that they are their own antiparticles. If this is so, there may

a discrepancy, but new programs will continue this search with much higher statistics. While the three families of leptons are in many ways analogous to the

to search for signs of CP violation outside the Standard Model, which might explain the dominance of matter over anti-matter. Neither experiment found such

Kobayashi and Maskawa observed that if there were three families of quarks, CP violation would arise quite naturally. The Standard Model suggested that CP

large effect in weak interactions, CP violation seemed small and confined to the kaons. When the Standard Model of particle physics emerged in early 1970’s,

matter anti-matter asymmetry, CP violation is the focus of much of the international experimental program in particle physics. CP conservation was what could

might phrase it “Why is there more matter than anti-matter?” Because, as Andrei Sakharov first showed, CP violation is necessary to any explanation of the

ROBERT CAHN, Lawrence Berkeley National Laboratory — There is no scientific question more fundamental than “Why are we here?” or as we physicists

magnet technology have made it possible to identify the parameters of meaningful experiments capable of exploring D-D and D-3He burn conditions. At the same time an experimental program (IGNIR) has been undertaken through a (funded) collaboration between Italy and Russia to investigate D-T plasmas close to ignition conditions based on an advanced high field toroidal confinement configuration. A. Sakharov envisioned a bolder approach to fusion research than that advocated by some of his contemporaries. The time taken to design and decide to fabricate the first experiment capable of reaching ignition conditions is due in part to the problem of gaining an adequate understanding the expected physics of fusion burning plasmas. However, most of the relevant financial effort has gone in the pursuit of slow and indirect enterprises complying with the “playing it safe” tendencies of large organizations or motivated by the purpose to develop technologies or maintain a high level of expertise in plasma physics to the expected benefit of other kinds of endeavors. The creativity demonstrated by A. Sakharov in dealing with civil rights and disarmament issues is needed, while maintaining our concerns for energy and the environment on a global scale, to orient the funding for fusion research toward a direct and well based scientific effort on concepts for which a variety of developments can be envisioned. These can span from uncovering new physics relevant, for instance, to high energy astrophysics to the feasibility of new neutron sources.


1Sponsored in part by the US Department of Energy.

3:06PM L2.00002 CP Violation and the Matter Anti-Matter Asymmetry of the Universe1, ROBERT CAHN, Lawrence Berkeley National Laboratory — There is no scientific question more fundamental than “Why are we here?” or as we physicists might phrase it “Why is there more matter than anti-matter?” Because, as Andrei Sakharov first showed, CP violation is necessary to any explanation of the matter anti-matter asymmetry, CP violation is the focus of much of the international experimental program in particle physics. CP conservation was what could be salvaged after parity was overthrown in 1956, but it survived only until 1964 when K mesons were found not to respect it. While parity violation was a large effect in weak interactions, CP violation seemed small and confined to the kaons. When the Standard Model of particle physics emerged in early 1970’s, Kobayashi and Maskawa observed that if there were three families of quarks, CP violation would arise quite naturally. The Standard Model suggested that CP violation could be large in decays of B mesons. Nonetheless, no matter what parameters are used in the Standard Model, CP violation among quarks cannot be large enough to explain the matter anti-matter asymmetry. Major experiments in the U.S. and Japan were undertaken to explore CP violation in B mesons to search for signs of CP violation outside the Standard Model, which might explain the dominance of matter over anti-matter. Neither experiment found such a discrepancy, but new programs will continue this search with much higher statistics. While the three families of leptons are in many ways analogous to the three families of quarks, the neutrinos have a unique character. As neutral particles, it is possible that they are their own antiparticles. If this is so, there may be additional, very heavy, neutrinos beyond those we know already. If they violate CP they may be the source of the matter anti-matter asymmetry. But do neutrinos experience CP violation? Experiments around the world are just now setting out to answer this question.

1Supported by the U.S. Department of Energy under Contract No. DE-AC02-05CH11231

3:42PM L2.00003 Sakharov and his Times, TATIANA YANKELEVICH, Harvard — No abstract available.

4:18PM L2.00004 Sakharov Prize Lecture, RICHARD WILSON, Harvard University — No abstract available.

4:54PM L2.00005 Scientists and Human Rights, YOUSEF MAKDISI, Brookhaven National Laboratory — The American Physical Society has a long history of involvement in defense of human rights. The Committee on International Freedom of Scientists was formed in the mid seventies as a subcommittee within the Panel On Public Affairs “to deal with matters of an international nature that endangers the abilities of scientists to function as scientists” and by 1980 it was established as an independent committee. In this presentation I will describe some aspects of the early history and the impetus that led to such an advocacy, the methods employed then and how they evolved to the present CIFS responsibility “for monitoring concerns regarding human rights for scientists throughout the world”. I will also describe the current approach and some sample cases the committee has pursued recently, the interaction with other human rights organizations, and touch upon some venues through which the community can engage to help in this noble cause.

Wednesday, February 29, 2012 2:30PM - 5:30PM –
Session T2 FIP: Invited Session: PIRE in Condensed Matter 204AB

— No abstract available.
2:30PM T2.00001 Terahertz Dynamics in Carbon Nanomaterials¹, JUNICHIRO KONO, Rice University —
This NSF Partnerships for International Research and Education (PIRE) project supports a unique interdisciplinary and international partnership investigating terahertz (THz) dynamics in nanostructures. The 0.1 to 10 THz frequency range of the electromagnetic spectrum is where electrical transport and optical transitions merge, offering exciting opportunities to study a variety of novel physical phenomena in condensed matter. By combining THz technology and nanotechnology, we can advance our understanding of THz physics while improving and developing THz devices. Specifically, this PIRE research explores THz dynamics of electrons in carbon nanomaterials, namely, nanotubes and graphene — low-dimensional, sp²-bonded carbon systems with unique finite-frequency properties. Japan and the U.S. are global leaders in both THz research and carbon research, and stimulating cooperation is critical to further advance THz science and to commercialize products developed in the lab. However, obstacles exist for international collaboration — primarily linguistic and cultural barriers — and this PIRE project aims to address these barriers through the integration of our research and education programs. Our strong educational portfolio endeavours to cultivate interest in nanotechnology among young U.S. undergraduate students and encourage them to pursue graduate study and academic research in the physical sciences, especially those from underrepresented groups. Our award-winning International Research Experience for Undergraduates Program, NanoJapan, provides structured research internships in Japanese university laboratories with Japanese mentors — recognized as a model international education program for science and engineering students. The project builds the skill sets of nanoscience researchers and students by cultivating international and inter-cultural awareness, research expertise, and specific academic interests in nanotechnology. U.S. project partners include Rice University, the University of Florida, the University of Tulsa, the State University of New York at Buffalo, Southern Illinois University at Carbondale, and Texas A&M University. Japanese partners include: Osaka University, Chiba University, Shinshu University, Tohoku University, the University of Tokyo, the National Institute of Information and Communications Technology, the National Institute of Materials Science, Hokkaido University, RIKEN, and the University of Aizu.

¹This PIRE project is cofunded by the Office of International Science and Engineering, the Division of Electrical, Communications, and Cyber Systems, and the Division of Materials Research of the National Science Foundation.

3:06PM T2.00002 Petascale Many Body Methods for Complex Correlated Systems, THOMAS PRUSCHKE, Georg-August-Universität Göttingen — Correlated systems constitute an important class of materials in modern condensed matter physics. Correlation among electrons is at the heart of all ordering phenomena and many intriguing novel aspects, such as quantum phase transitions or topological insulators, observed in a variety of compounds. Yet, theoretically describing these phenomena is still a formidable task, even if one restricts the models used to the smallest possible set of degrees of freedom. Here, modern computer architectures play an essential role, and the joint effort to devise efficient algorithms and implement them on state-of-the-art hardware has become an extremely active field in condensed-matter research. To tackle this task single-handed is quite obviously not possible. The NSF-OISE funded PIRE collaboration “Graduate Education and Research in Petascale Many Body Methods for Complex Correlated Systems” is a successful initiative to bring together leading experts around the world to form a virtual international organization for addressing these emerging challenges and educate the next generation of computational condensed matter physicists. The collaboration includes research groups developing novel theoretical tools to reliably and systematically study correlated solids, experts in efficient computational algorithms needed to solve the emerging equations, and those able to use modern heterogeneous computer architectures to make then working tools for the growing community.

3:42PM T2.00003 Polymers at Interfaces: US-Korea International Research and Education Partnership¹, CHANG YEOL RYU, Rensselaer Polytechnic Institute — Our NSF program of Partnership for International Research and Education (PIRE) is focused on the development and training of graduate, undergraduate students and faculty members in the field of polymer physics by promoting both domestic and international research collaborations with specific exchange opportunities for both US and Korean participants. This collaborative effort by a group of 5 US faculty members is motivated by the global partnership with Korean polymer physicists to promote novel opportunities in polymer science research and education. Our PIRE program involves a focused research plan at the forefront of polymer physics based on the synthesis, separation, characterization, and theory of synthetic polymers in bulk and at interfaces. The multifaceted research activities spanning the areas of polymer synthesis, characterization, property modifications and their modeling will be presented to advance our knowledge on polymer behaviors at interfaces.

4:18PM T2.00004 SPIRE, the “Spin Triangle”: Athens, Hamburg, Buenos Aires: Advancing Nanospintronics and Nanomagnetism¹, ARTHUR R. SMITH, Ohio University Nanoscale and Quantum Phenomena Institute — Future technological advances at the frontier of ‘electronics’ will increasingly rely on the use of the spin property of the electron at ever smaller length scales. As a result, it is critical to make substantial efforts towards understanding and ultimately controlling spin and magnetism at the nanoscale. In SPIRE, the goal is to achieve these important scientific advancements through a unique combination of experimental and theoretical techniques, as well as complementary expertise and coherent efforts from the collaborators. The key experimental tool of choice is spin-polarized scanning tunneling microscopy — the premier method for accessing the spin structure of surfaces and nanostructures with resolution down to the atomic scale. At the same time, atom and molecule deposition and manipulation schemes are added in order to both atomically engineer, and precisely investigate, novel nanoscale spin structures. These efforts are being applied to an array of physical systems, including single magnetic atomic layers, self-assembled 2-D molecular arrays, single adatoms and molecules, and alloyed spintronic materials. Efforts are aimed at exploring complex spin structures and phenomena occurring in these systems. At the same time, the problems are approached, and in some cases guided, by the use of leading theoretical tools, including analytical approaches such as renormalization group theory, and computational approaches such as first principles density functional theory. The scientific goals of the project are achieved by a collaborative effort with the international partners, engaging students at all levels who, through their research experiences both at home and abroad, gain international research outlooks as well as understandings of cultural differences, by working on intriguing problems of mutual interest. A novel scientific journalism internship program based at Ohio University further the project’s broader impacts.

¹The NSF PIRE program is gratefully acknowledged.

4:54PM T2.00005 Super-PIRE: International Consortium for Proving Novel Superconductors³, YASUTOMO UEMURA, Department of Physics, Columbia University — The Super-PIRE project aims to study high-Tc cuprates, FeAs, heavy-fermion and other unconventional superconductors by using neutron scattering, muon spin relaxation, X-ray scattering, optical conductivity, ARPES and STM measurements in international collaboration. The project includes US PI’s Billee, Pasupathy, Uemura (Columbia), and Dai (UTK/ORNL), Project Patron (PP) Balatsky (LANL), and foreign PI’s Uchida, Tajima, Maekawa, Eisaki (Japan), Hayden (UK), Wang (China), Luke (Canada), and about 40 additional “Local Experts” from institutions of the PI/PP’s. In this talk, we introduce the organization of the project, initial scientific products including 4 papers published in Nature group journals, and the out-reach effort centered in organizing special graduate and undergraduate courses at Columbia recorded as voice-synchronized ppt presentations, and then broadcasted in a class-room of Tokyo University. Homepage address: http://www.phys.utk.edu/superpire/members.html

³This PIRE project is cofunded by the Office of International Science and Engineering, the Division of Electrical, Communications, and Cyber Systems, and the Division of Materials Research of the National Science Foundation.

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**Thursday, March 1, 2012 11:15AM - 2:15PM**

**Session W20 FPS FIP DCMP: Invited Session: Nuclear Power, One Year After Fukushima**

**253C**
if these requirements are met. It will also describe some of the reactions to the Fukushima accident from officials associated with nuclear energy in India.

India has ambitious plans for expanding nuclear power over the next few decades. A major accident in a densely populated country like India can be catastrophic and thus of concern. There are both technical and organizational requirements for safety of nuclear facilities. This talk will describe some of the organizational

resolute commitment to rapid growth of safe nuclear energy, detailed analyses of its nuclear safety regulatory system are required. This talk explains China's

China is strengthening its nuclear safety at reactors in operation, under construction and in preparation, including efforts to improve nuclear safety regulations and guidelines based on lessons learned from the accident. Although China is one of the major contributors in the global nuclear expansion, China’s nuclear power industry is relatively young. Its nuclear safety regulators are less experienced compared to those in other major nuclear power countries. To realize China’s resolute commitment to rapid growth of safe nuclear energy, detailed analyses of its nuclear safety regulatory system are required. This talk explains China's nuclear energy program and policy at first. It also explores China's governmental activities and future nuclear development after Fukushima accidents. At last, current US fleet of operating reactors has over the last decades implemented numerous reviews assessing external hazards with post 911 actions being the most current. The industry took immediate actions following the March accident to verify existing capabilities to address events driven from external hazards and is now implementing a “Way Forward” plan that has as a priority the continued safe operation of the existing US fleet while examining both the technical and organizational root causes of the Fukushima Dai-ichi accident. Industry focus is to provide additional defense in depth through a “Flex” approach that adds the most significant safety benefit in the most efficient time frame. From a topical perspective, the industry is in agreement with the tier 1 recommendations from the NRC near term task force report. Southern Nuclear Operating Company operates 6 reactors and is building Vogtle 3&4 which is expected to be granted a COL in the near term. This generation III+ reactor design has passive safety features that would have mitigated an event similar to the Fukushima accident.

The accident demonstrated the need at nuclear plants for robust, highly reliable backup power sources capable of functioning for many days in the event of a complete loss of primary off-site and on-site electrical power. It highlighted the importance of detailed planning for severe accident management that realistically evaluates the capabilities of personnel to carry outmitigation operations under extremely hazardous conditions. It showed how emergency plans rooted in the assumption that only one reactor at a multi-unit site would be likely to experience a crisis fail miserably in the event of an accident affecting multiple reactor units simultaneously. It revealed that alternate water injection following a severe accident could be needed for weeks or months, generating large volumes of contaminated water that must be contained. And it reinforced the grim lesson of Chernobyl: that a nuclear reactor accident could lead to widespread radioactive contamination with profound implications for public health, the economy and the environment. While many nations have re-examined their policies regarding nuclear power safety in the months following the accident, it remains to be seen to what extent the world will take the lessons of Fukushima seriously and make meaningful changes in time to avert another, and potentially even worse, nuclear catastrophe.

While water makeup continued by AC-independent systems to keep the fuel core covered by coolant, operating team tried to depressurize and enable low pressure injection to the reactor to avoid overheating but was not successful enough primarily due to limited available resources. This resulted in core melt, hydrogen explosion and release of radioactivity to the environment. Key lessons learned are; 1) safety regulation and safety culture, 2) workable/executable severe accident management procedure, 3) crisis management and 4) design. Implications on security include revealed vulnerability and the nexus of safety and security. Given the scale of damage to the environmental, attention must be paid to defense against it and to societal safety goal of nuclear power by considering offsite remedial costs, compensation to damage, energy replacement cost etc. A sort of root cause analysis first by asking “Why nuclear community failed to prevent this accident?” was initiated by the University of Tokyo.

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EDWIN LYMAN, Union of Concerned Scientists — The March 2011 accident at the Fukushima Daiichi nuclear power plant has revealed serious vulnerabilities in the design, operation and regulation of nuclear power plants. While some aspects of the accident were plant- and site-specific, others have implications that are broadly applicable to the current generation of nuclear plants in operation around the world. Although many of the details of the accident progression and public health consequences are still unclear, there are a number of lessons that can already be drawn. The accident demonstrated the need at nuclear plants for robust, highly reliable backup power sources capable of functioning for many days in the event of a complete loss of primary off-site and on-site electrical power. It highlighted the importance of detailed planning for severe accident management that realistically evaluates the capabilities of personnel to carry outmitigation operations under extremely hazardous conditions. It showed how emergency plans rooted in the assumption that only one reactor at a multi-unit site would be likely to experience a crisis fail miserably in the event of an accident affecting multiple reactor units simultaneously. It revealed that alternate water injection following a severe accident could be needed for weeks or months, generating large volumes of contaminated water that must be contained. And it reinforced the grim lesson of Chernobyl: that a nuclear reactor accident could lead to widespread radioactive contamination with profound implications for public health, the economy and the environment. While many nations have re-examined their policies regarding nuclear power safety in the months following the accident, it remains to be seen to what extent the world will take the lessons of Fukushima seriously and make meaningful changes in time to avert another, and potentially even worse, nuclear catastrophe.

In response to the Fukushima accident, China’s nuclear safety at reactors in operation, under construction and in preparation, including efforts to improve nuclear safety regulations and guidelines based on lessons learned from the accident. Although China is one of the major contributors in the global nuclear expansion, China’s nuclear power industry is relatively young. Its nuclear safety regulators are less experienced compared to those in other major nuclear power countries. To realize China’s resolute commitment to rapid growth of safe nuclear energy, detailed analyses of its nuclear safety regulatory system are required. This talk explains China’s nuclear energy program and policy at first. It also explores China’s governmental activities and future nuclear development after Fukushima accidents. At last, an overview of China’s nuclear safety regulations and practices are provided. Issues and challenges are also identified for police makers, regulators, and industry professionals.

India has ambitious plans for expanding nuclear power over the next few decades. A major accident in a densely populated country like India can be catastrophic and thus of concern. There are both technical and organizational requirements for safety of nuclear facilities. This talk will describe some of the organizational factors that safety theorists have identified and examine, from the publicly available information about incidents and failures at India’s nuclear facilities to see if these requirements are met. It will also describe some of the reactions to the Fukushima accident from officials associated with nuclear energy in India.