Forum on International Physics

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

Fall 2012 Newsletter

Ernie Malamud, Editor

IN THIS ISSUE

From the Editor, *Ernie Malamud* 2

APS Office of International Affairs, *Amy Flatten* 2

Announcement of new AAAS journal: Science & Diplomacy 4

African School of Fundamental Physics and its Applications, *from Christine Darve* 5

Summary of FIP Sessions at the APS Spring Meetings 6

Articles

The Time of Green Delusion in Sweden is Over, *František Janouch* 9

Egypt Connection, *Sultana N. Nahar* 11

Discovery of a New Particle at 125 GeV,
Physics, Technology and Cyberinfrastructure, *Harvey B. Newman* 13

Fang Lizhi, An Appreciation, *Jim Williams* 16

PAST2012—Exploring the Terascale and Beyond, *Marleigh Sheaff* 20

Korean Contribution to the Progress of Science and Humanity, *Dong-Pil Min* 22

FIP Committees—2012 27

From the Editor

Ernie Malamud

Will the lead article in this issue "The Green Delusion in Sweden is Over" stir controversy? Do you feel that nuclear fission is a green solution to the planet's energy problems? The last sentence in Professor Janouch's article "The history of Swedish energy policy can teach a valuable lesson to other countries such as Germany that are attempting to abandon nuclear energy" is provocative. I welcome letters to the Editor on this article for our Spring 2013 issue.

In this issue is an excellent article by Jim Williams about Fang Lizhi, a truly remarkable person. Recently there have been several eloquent eulogies about Fang. They are complementary to Williams' account and illustrate various aspects of this outstanding individual's life and contributions to science and to the international freedom of scientists. I refer the interested reader to:

> Fang Lizhi 1936-2012, by Johann Rafelski, and Remo Ruffini, CERN Courier, June 2012.
>
> Ode to an Astrophysicist: Fang Lizhi, by Alaina G. Levine, APS News **21** #5, May 2012.

In this issue are contributions from many different parts of the globe. I thank all of the authors for their contributions as well as our Newsletter Committee for their excellent suggestions I encourage FIP members to suggest topics and authors for future issues.

The deadline for receipt of materials for the Spring 2013 issue is February 15. It will help if you can send me material in MSword format and graphical material as JPGs. Photos and other graphical material enhance the newsletter. It also helps if you are covering more than one topic in an article to divide the material into several shorter articles.

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

American Physical Society Office of International Affairs

Amy Flatten

As we have progressed through 2012, you may have already seen announcements and calls for proposals for a few of our ongoing programs: 1) the International Travel Grant Award Program (ITGAP), 2) the Brazil-US Physics Student Visitation Program and Professorship/Lectureship Program and 3) our partnership with the Indo-US Science and Technology Forum (IUSSTF) toward exchanges of graduate students and professors between the United States and India. These are wonderful programs that have provided outstanding opportunities for exchange and collaboration. They are all probably familiar to the FIP membership by now (if not, please contact me or visit www.aps.org/international) Consequently, I am going to use this article to tell you about recent developments—ones that may lead us in new directions from opportunities unfolding over the next few months.

(Continued on page 3)

(Continued from page 2)

Korea

On February 7, 2012, the Presidents of the Korean Physical Society (KPS) and the American Physical Society (APS) met to discuss strengthening the collaboration and communication between the two organizations, and to promote scientific exchange between physicists from the Republic of Korea and the US The presidents of both Societies agreed to sign a Memorandum of Understanding that proposed the following:

1. APS and KPS should hold joint meetings in areas of physics that are of mutual interest. Both organizations would consult with their respective leadership and scientific disciplinary units, and if approved, an international advisory committee will be convened to develop further details.

2. KPS and APS will explore ways to coordinate and support physicist exchanges. These exchanges may support professors delivering a short course or a lecture series in an overseas institution, or graduate students who, in coordination with their academic advisers and hosts, conduct research in a Korean or US laboratory.

3. The APS Office of International Affairs (INTAF), along with the Committee on International Scientific Affairs (CISA), will maintain liaisons with the International Cooperation Committee of the KPS for the purpose of discussing future collaborations and activities of mutual interest. To facilitate the exploration of suitable joint activities, INTAF and CISA will collaborate closely with the Association of Korean Physicists in America (AKPA).

The Association for Korean Physicists in America (AKPA) was invaluable in helping facilitate the meeting between the two Presidents. In April, the KPS celebrated its 60th anniversary at its annual meeting held in Daejeon, Korea. To help celebrate the anniversary, APS Past President Barry Barish spoke at a special forum that featured the presidents of world's leading physical societies. During his remarks, he presented the MOU, signed by current APS President Bob Byer, and received the signature of the KPS President Shin.

China

APS has also been exploring ways to increase our engagement with the Chinese physics community. At the 2012 APS March Meeting, leaders of the Chinese Physical Society and the American Physical Society met to discuss possible new initiatives that would strengthen communication and collaboration between the two organizations. The meeting was attended by APS Operating Officers Kate Kirby, Gene Sprouse, and Joe Serene, as well as Ling Miao, who serves as Special Assistant to the Editor in Chief for China and Editor of Physical Review X, and me, Director of the APS Office of International Affairs. Attendees from the Chinese Physical Society included Enge Wang, Vice President; Yupeng Wang, Vice President & Secretary General; Li Lu, Member of the Standing Council and Mu Wang, Member of the Standing Council. The meeting provided an opportunity to explore ideas for joint programs or other initiatives that could be of mutual interest.

The discussion also focused upon opportunities for APS leaders to visit China this summer and fall. Toward that end, APS President Bob Byer attended the 80th anniversary of the Chinese Physics Society that was held in Beijing during August 2012. While there, he gave a speech about the status and prospects of physics in the United States.

Following President Byer's visit to China in August, an APS delegation comprised of Kate Kirby, APS Executive Officer, Karsten Heeger, Chair of the Committee on International Scientific Affairs, Gang Cao, CISA member, and myself, will travel to China for a series of events and additional meetings with CPS leaders and Chinese physicists. The delegation will be joined for some parts of the trip by editors from the APS Editorial office in Ridge New York, including Ling Miao (mentioned above).:

(Continued on page 4)

(Continued from page 3)

Highlights of the delegation's visit include:

- Sep 15-16, 2012: Shanghai Particle Physic Symposium, Shanghai SJTU
- Sep 17-20, 2012: US-China Summer School in Neutrino and Dark Matter Physics, Shanghai SJTU
- Sep 20-22, 2012: Chinese Physical Society Annual Meeting (This will include the first-ever, Joint Scientific Session between the CPS & APS), Guangzhaou
- Sep 23-26, 2012: International Symposium on Neutrino Physics and Beyond, Shenzhen (near Daya Bay)

As these visits will allow APS leaders to better understand how we might strengthen the partnership between our two physics communities, I will keep the FIP members apprised of the outcomes. Look for more in the next FIP Newsletter, Spring 2013.

India/ Sri Lanka/Southeast Asia

The Committee on International Scientific Affairs (CISA) is launching a trial project to bring physics seminars or "webinars" to physicists in Southeast Asia. CISA hopes this will broaden connections between the US and Southeast Asian physicists. The webinars will be on topics of interest in the region, and already we have a number of volunteers serving as "coordinators and facilitators" in their home institutions. Led by CISA member, Prof. Unil Perera, representatives from the region have undertaken a "test-run" of the APS Webinar system, and have proposed a number of potential seminar topics. CISA also envisions these webinars as a means for linking to graduate students in India and Southeast Asia. Here, topics can serve the students' interests as well as early career physicists. As this project is only in its earliest stages, I look forward to sharing additional progress with FIP members over the next few months.

While the aforementioned activities are just a few "new" efforts that we are undertaking, I would like to encourage FIP members to continually visit our webpage for: 1) updates on our existing, ongoing programs, 2) application deadlines for our exchanges with India, Brazil, and the ITGAP, and 3) for developments in visa processing that are expected to be announced by the State Department in the new year. (So far, that's all we know about these "improvements," but we'll be sure to keep FIP members apprised of any changes to visa processing.) In the mean time, I would welcome the chance to hear from you regarding your interests, ideas and proposals to work together. Please do not hesitate to contact me at: Flatten@aps.org.

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

Announcement of new AAAS journal: Science & Diplomacy

The first issue of this new quarterly was March of this year.

From the journal's web page (http://www.sciencediplomacy.org/

> Science & Diplomacy provides a forum for rigorous thought, analysis, and insight to serve stakeholders who develop, implement, and teach all aspects of science and diplomacy. The online quarterly features a mix of original perspectives and research articles by science and diplomacy practitioners and thinkers from U.S. and international perspectives in areas of science for diplomacy; science in diplomacy; and diplomacy for science. The quarterly strives to be a resource for foreign policy makers and analysts, scientists and research administrators, and educators and students.

The second African School of Fundamental Physics and its Applications, ASP2012, Kwame Nkrumah University of Science of Technology (KNUST), Ghana

Submitted by Christine Darve (European Spallation Source, SE) on behalf of the ASP2012 International Organizing Committee

During the three and a half week school, July 15 through August 8, forty-nine students from fifteen African countries plus one student from Iran have been trained by world renowned scientists. ASP2012, sponsored by twenty-two institutions, has demonstrated the capacity and resources available in an African university and was an opportunity to discover young African talent. The goal of the school is to be a catalyzer to improve the quality of physics education in Africa. More information is at http://africanschoolofphysics.web.cern.ch

FIP Sessions and Events at the APS Spring Meetings

The APS web pages have links to the abstracts and in many cases the presentations themselves. The links are to the “Epitome” of each meeting, and from there it is easy to find the specific talk using the session number and then the specific talk.

[March Meeting 2012]

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

B2: Science Diplomacy: Africa and the Middle East. Sponsoring Unit: FIP
Chair: William Barletta, USPAS/Massachusetts Institute of Technology

Christine Darve, “Fundamental Physics and Accelerator Sciences in Africa”
Sekazi Mtingwa, “ The African Laser Centre: Transforming the Laser Community in Africa”
Herman Winick, “SESAME -- A light source for the Middle East”
Omer Yavas, *Marshak Lectureship*: “The Turkish Accelerator Center, TAC”
Mulugeta Bekele, *Andrei Sakharov Prize Lecture*: “Physics and Freedom in Ethiopia”

L2: Andrei Sakharov Prize Session. Sponsoring Units: DPB, FIP
Chair: W. Barletta, Massachusetts Institute of Technology

Bruno Coppi, “A. Sakharov and Fusion Research”
Robert Cahn, “CP Violation and the Matter Anti-Matter Asymmetry of the Universe”
Tatiana Yankelevich, “Sakharov and his Times”
Richard Wilson, “Sakharov Prize Lecture”
Yousef Makdisi, “Scientists and Human Rights”

T2: PIRE in Condensed Matter. Sponsoring Unit: FIP
Chair: Joan Frye, National Science Foundation

Junichiro Kono, “Terahertz Dynamics in Carbon Nanomaterials”
Thomas Pruschke, “Petascale Many Body Methods for Complex Correlated Systems”
Chang Yeol Ryu, “Polymers at Interfaces: US-Korea International Research and Education Partnership”
Arthur R. Smith, “SPIRE, the ``Spin Triangle": Athens, Hamburg, Buenos Aires: Advancing Nanospintronics and Nanomagnetism”
Yasutomo Uemura, “Super-PIRE: International Consortium for Proving Novel Superconductors”

J27: International Energy Perspectives. Sponsoring Units: FIP, GERA
Chair: William Barletta, Fermilab

Mark Levine, “Energy production and use in China”
Carmine Difiglio, “Economics of Energy Alternatives”
Richard Lester, “Future Trends and Issues in Nuclear Power”

(Continued on page 7)

(Continued from page 6)

Alexis Malozemoff, “Science for Sustainable Energy: Recommendations of the 2010 BESAC Report”
Ellen Stechel, “Fuel from Sunlight: Prospects and Approaches”

W20: Nuclear Power, One Year After Fukushima. Sponsoring Units: FPS FIP DCMP
Chair: David Wright, Union of Concerned Scientists

Akira Omoto, “The Accident at TEPCO's Fukushima-Daiichi Nuclear Power Plant: Technical Description of What Happened and Lessons Learned for the Future”
Stephen Kuczynski, “The U.S. nuclear industry following the Fukushima event”
Edwin Lyman, “Lessons from Fukushima for Improving the Safety of Nuclear Reactors”
Yun Zhou, “Nuclear Power in China”
M.V. Ramana, “Nuclear Power in India”

April Meeting 2012

March 31 - April 3, Atlanta, GA “100 Years of Cosmic Ray Physics”

H4: Science Diplomacy: Accelerator Based Science in Korea.
Sponsoring Units: DPB, FIP
Chair: Kwang-Je Kim, Argonne National Laboratory

Won Namkung, “Introduction to Korean Accelerator Science and Activities in Industrial Accelerators”
Dong-Pil Min, “Korean Contribution to the Progress of Science and Humanity”
M.H. Cho, “Synchrotron Radiation and X-ray FEL Projects in Korea”

H6: Energy Services for the Developing World I. Sponsoring Units: GERA, FIP
Chair: Alvin Compaan, University of Toledo

Ashok Gadgil, “Fuel efficient stoves for the poorest two billion”
Kurt Kornbluth. “Lighting for the unelectrified billion”
Jeffrey Nelson, “Solar Glitter: Low Cost, Solar Energy Harvesting with Microsystems Enabled Photovoltaics”

J12: Energy Services for the Developing World II. Sponsoring Units: FIP, GERA
Chair: Ellen Stechel, Sandia National Laboratories

Alexie Kolpak, “Hybrid chromophore/template nanostructures: a customizable platform material for emissions-free solar energy storage and conversion”
Trudy Forsyth, “Distributed wind power for developing nations”

(Continued on page 8)

(Continued from page 7)

Session W6: Panel Discussion: Challenges for Early Career Researchers in International Collaborations and Exchanges.
Sponsoring Units: FIP, FGSA
Chair: Renee Horton, Louisiana State University

Lindley Winslow, “Collaborating across the ocean”

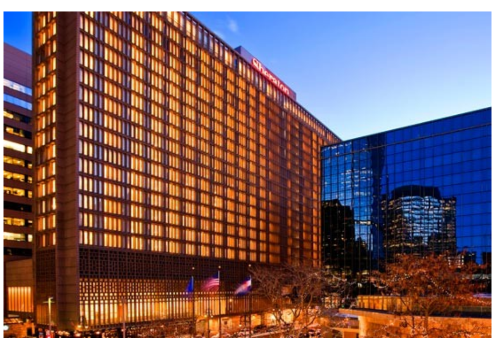
Mark your calendars for the Spring 2013 APS Meetings!

Your Program and Executive Committees are hard at work lining up great invited sessions.

March Meeting 2013 • March 18 - March 22 • Baltimore, Maryland

The APS March Meeting to be held at the Baltimore Convention Center is the largest physics meeting in the world, focusing on physics research from industry, universities, and major labs. Scientific sessions and supplemental events for 2013 will take place at the Baltimore Convention Center (BCC). Scientific sessions will be presented at the Baltimore Convention Center. The outstanding scientific program should include over 100 invited sessions and more than 550 contributed sessions at which approximately 7,000 papers will be presented.

April Meeting 2013 • April 13 - April 16 • Denver, Colorado



The APS April Meeting gathers particle physicists, nuclear physicists, and astrophysicists to share new results and insights. April Meeting 2013 scientific sessions and ancillary activities will take place at the Sheraton Denver Downtown Hotel. The April Meeting will offer its usual outstanding scientific program of three plenary sessions (nine plenary talks), approximately 75 invited sessions, more than 100 contributed sessions, and poster sessions. One evening there will be a special public lecture.

The Time of Green Delusion in Sweden is Over

František Janouch

In the middle of the 1970s, a coalition of green groups began to concentrate their fire against nuclear energy in Sweden. The result was a referendum in 1980 in which citizens had to choose among three unclearly formulated alternatives concerning the future of nuclear energy in their country. As a follow-up, in the mid-1980s, the Swedish parliament passed a law to stop the use of nuclear energy. Moreover, paragraph 6 of the new law banned scientific research and development of technologies which would lead to the construction of new nuclear power reactors or improvement of existing reactors. The law further stipulated that twelve nuclear power reactors, both operating and under construction, would be closed not later than 2010. That specific date was “calculated" by the legislators in the following way: the commonly held opinion at the beginning of the eighties was that the duration of safe exploitation of a reactor is 25 years, and, as the last reactor under construction at that time was planned to be commissioned in 1985, the legislators easily came to the specified date. Even experienced legislators can make blunders, sometimes quite serious. In 1990, Swedish nuclear plants supplied over 45% of electric energy; hydroelectric plants added almost 45%. The carbon dioxide emission in Sweden was one of the lowest in the world.

The majority of the twelve nuclear reactors operating in Sweden at the beginning of the 1980s were designed and built in Sweden. Like many other Swedish-made industrial products, they proved themselves to be among the best in the world. The reactors, built at the well-known plant ASEA-Atom (later ABB Atom, and now Westinghouse Atom that belongs to Toshiba) were boiling water reactors (BWR). The combined efforts of greens and their allies soon led to a further set-back. At the beginning of the new millennium, after a political deal with the Social Democrats, the two well-functioning reactor blocks (total 1200 MW) in Barsebäck, South Sweden, were closed. Although the proponents neglected to estimate the impact on the Swedish economy, the country did feel the deficit of electrical energy. In the end, the nuclear regulatory authorities allowed the majority of the remaining ten nuclear plants to increase their power in order to compensate for the shortage of electricity.

In the mid-eighties, the designers and manufacturers of nuclear plants carried out a thorough study of one of the oldest Swedish reactors operating for almost twenty years with an amazing result: the reactor revealed no traces of deterioration. The nuclear regulators thus commissioned this reactor for another (at least) twenty years of operation.

In 2006, the Swedish parliament finally rescinded paragraph 6 of the anti-nuclear law. It was impossible to explain to its citizens and the world alike why Sweden, a free and technologically advanced country, should forbid its own engineers and technical specialists from conducting research and development in an advanced area of energy science and technology. Finally, in 2010, the Swedish parliament cancelled the ban on the operation of Swedish nuclear plants after 2010. Building new nuclear energy blocks is also permitted. The reason was that, in spite of the closure of Barsebäck, the remaining nuclear power reactors still supplied in 2010 almost the same 40% of electrical energy as at the end of the 1980s. Moreover, this energy was the cheapest in Sweden as plant overhead expenses had been amortized over 25 years. The low cost of produced electrical energy balanced the traditionally expensive cost of the Swedish workforce, therefore making high-quality, Swedish high-technology articles competitive on the world market.

Most recently Sweden is taking the next step in the fight against the “green delusion". Dagens Nyheter, a highly influential newspaper, published a long article, “Proposed new reactor should be built in Oskarshamn.” The authors were Janne Wallenius, professor of reactor physics at the Royal Institute of Technology in Stockholm, and Jochan Hallén, the director general of Westinghouse Atom. The authors welcomed the recent

(Continued on page 10)

(Continued from page 9)

changes in Swedish legislation and called for restoring Sweden to its leading role in nuclear energy as was the case in the 1970s. The necessary first steps in this direction are related to building a "generation four" nuclear reactor in Oskarshamn. This location is the site of a large international project on radioactive waste burial, accomplished during the last twenty-five years, namely a shaft a few hundred meters deep into which even large trucks can enter. The leadership of the existing nuclear plant in Oskarshamn, as well as local regional self-government, are receptive to building a new nuclear facility and are ready to support the project.

Sweden has awakened from thirty years of green darkness. The country is capable of regaining its status as one of the leading international forces in the development of nuclear energy. The history of Swedish energy policy can teach a valuable lesson to other countries such as Germany that are attempting to abandon nuclear energy.

Professor František Janouch, a well-known Czech nuclear physicist, is at the Royal Institute of Technology, Stockholm, Sweden. Translation by Vladimir Zelevinsky, Michigan State University.

Barsebäck is a closed BWR nuclear power plant in Sweden, situated in Barsebäck, Skåne. Located just 20 kilometers from Copenhagen, the Danish government pressed for its closure during its entire lifetime. As a result of the Swedish nuclear power phase-out, its two reactors have now been closed. The first reactor, Barsebäck 1, was closed November 30, 1999, and the second, Barsebäck 2, ceased operations May 31, 2005.
(From Wikipedia)

The nuclear power station Oskarshamn is one of three active nuclear power stations in Sweden. The plant is about 30 kilometers north of the city of Oskarshamn on the Baltic Sea coast. The three reactors produce about 10% of the electricity needs of Sweden. All reactors use BWR technology. Unit 1 has an installed output of 487 MW, Unit 2 627 MW, and Unit 3, the newest reactor block at the facility, has an installed output of 1,194 MW. The nuclear power station Oskarshamn is one of the largest power stations in the Nordic area. ***(From Wikipedia)***

Egypt Connection

Sultana N. Nahar

I traveled to Egypt in April to attend the international workshop on Ultrafast Laser Technologies and Applications (UFLTA), visit universities and participate in several important events.

The National Institute of Laser Enhanced Sciences (NILES) in Egypt has been one of the main sponsors of UFLTA. This 4th UFLTA was held both at Cairo University and in Luxor during April 8-12 and I delivered an honorary keynote speech on the application of X-ray lasers to cancer theranostics (a process of diagnostic therapy). Participants came from various universities and institutions in Egypt, Sudan, Saudi Arabia, Pakistan, and Korea.

At the closing session of the UFLTA conference I received a "Shield of UFLTA" award.

It was announced at the conference inauguration ceremony that the Chair, Professor Ahmed El Kharborly, was the first *elected* Dean of NILES. Before the Egyptian revolution, all high administrative positions were *appointed* by the government. The Program Chair, Professor Lotfia El Nadi, wore a red hijab, outside her usual black or white one, in support of the revolution.

During my visit the Memorandum of Agreement (MOA) between Ohio State University (OSU) and Cairo University (CU) was completed at the signing ceremony headed by the Vice President for Graduate Studies and Research, Dr. Gamal Esmat of CU. I represented OSU. This MOA covers the Colleges of Arts and Sciences, and Engineering. Work is in progress to extend it to the Medical College. I was the initiator and coordinator for the MOA at OSU. The collaboration between the two institutions was formulated after the international conference on Modern Trends in Physics Research (MTPR-08) held in Egypt in 2008 and was based on the research areas of common interest of atomic astrophysics and laser science. It required several years to complete the MOA, using both Arabic and English texts, and needing approvals from several offices of CU. And the Egyptian Ministry of Education approval occurred during the revolution. The signing ceremony was held in a historical room with many high level CU officials present. The event was covered by the media and was published in an Egyptian newspaper as well as posted on YouTube.

For my successful efforts on the MOA I was awarded the prestigious "Shield of Cairo University" by the CU Vice President.

On April 8, the Topical Society of Laser Sciences (TSLS) celebrated its 25th anniversary at Nady El.Kwat Al.Bahria on the river Nile. Internationally known and prominent scientists from Egypt and a number of other countries were invited. Several of them were recognized for contributions to laser sciences and 14 (including myself) were recognized with the "Highest Honor Medal". The cultural channel of the national

(Continued on page 12)

(Continued from page 11)

TV NILE covered the event and broadcast it on April 15, 2012. I was interviewed by the TV channel regarding the importance of research and on the contributions by the Egyptian researchers.

For some time I have been in communication with Al-Azhar University in Cairo, known as the oldest university on earth (founded in 970). During this trip I spent one day there. The university has male and female branches with adjoining campuses. Each has its own faculty members but with the same academic curriculum. There are also some joint projects for Ph.D. or Masters level research.

Audience listening to my seminar on atomic astrophysics at Al-Azhar University. At my request, the students and faculty members of the female branch were invited to my presentation at the male branch.

The audience was enthusiastic on the topic of spectroscopy and the solar abundance problem. The astronomy department chair, Professor Nader, commented that they were very much behind concerning the advanced research that I presented and also that their internet communication was not up to the date. Faculty members, from both male and female branches expressed difficulties in getting the right components for experimental research and in obtaining funding. They showed a keen interest in possible future collaboration in advanced research.

At another meeting with the male and female groups at Al Azhar University, we discussed STEM programs, research, teaching, funding, and collaborations. We spoke about promoting both teaching and research with students and prepared a draft proposal to submit to the Deans of Sciences of the male and female branches. I incorporated their input into the final proposal and submitted it to Al Azhar University. I will be sponsoring the program.

I held similar STEM, research, teaching, collaboration meetings with Cairo University. At the office of the Dean of Science we agreed on teaching and research policies for improvement and student encouragement. Besides sponsoring this proposal it was agreed that I would teach a course on atomic astrophysics at Cairo University later in 2012.

I also met Physics Professor Fayez Shahin of Beni Suef University regarding their undergraduate course and gave them a number of books for their undergraduate astronomy course. I have been connected to this university since 2006 when I began helping a physics lecturer during his PhD work.

Meeting of members of the International Society of Muslim Women in Science.

I had a few meetings with the women physicists at UFLTA, at Cairo University and at Al Azhar University regarding the International Society of Muslim Women in Science (ISMWS). Our motto is to encour-

(Continued on page 13)

(Continued from page 12)

age Muslim women to go into science professions. Everyone, including the male scientists at UFLTA, showed great interest in the society. At this time, ISMWS has about 70 members from 18 different countries. We discussed ways to encourage more Muslim women to have science careers and to keep them in the profession.

I had the opportunity to publicize the American Physical Society (APS) at the UFLTA inauguration, at Al-Azhar University, and to the Egyptian Physical Society (EPS) and informed them about the free APS individual and discount group memberships and of the proposal I am making to the APS. Participants from Pakistan, Sudan, Saudi Arabia and Egypt added their names to become part of my proposal.

The EPS was established in 1979 and has a few hundred members. It publishes the Egyptian Journal of Physics. The EPS annual membership fee is about $4 compared to the $128 of the APS. I met with the Professor Sami H Allam, the current president of EPS, and we discussed ways for the two societies to collaborate. Although Egyptian physicists are not very familiar with the APS, they showed a lot of interest in becoming APS members and liked the discount unity membership that I had proposed at the Forum of International Physics (FIP) meeting in Atlanta on March 31, 2012. The same support was echoed at Al-Azhar University and by participants at UFLTA. This strengthens my proposal to the APS. I am now collecting information from Bangladesh, Egypt, India, Iran, Iraq, Oman, Pakistan, Saudi Arabia, Sudan, Turkey, and UAE.

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

Discovery of a New Particle at 125 GeV:
Physics, Technology and Cyberinfrastructure

Harvey B Newman [*]

High energy physics experiments at the Large Hadron Collider (LHC) have begun to explore the fundamental properties of the forces and symmetries of nature, and the particles that compose the universe in a new energy range. In operation since 2009, the LHC experiments have distributed hundreds of petabytes of data worldwide. Many thousands of physicists analyze tens of millions of collisions daily, leading to weekly publications of new results in peer-reviewed journals.

The complexity and scope of the experimental detector facilities, the data acquisition, computing and software systems are all unparalleled in the scientific community. Many petascale data samples of events are extracted daily from hundreds of trillions of proton-proton collisions and are explored by thousands of physicists and students located at hundreds of sites interlinked by high speed networks around the world searching for new physics signals, supported by many hundreds of computer scientists and engineers. In spite of these challenges both of the two largest experiments, CMS and ATLAS, have optimized their analyses in many channels and produced groundbreaking results with a speed unprecedented in the field. The other major experiments at the LHC, ALICE and LHCb, also have made great strides and produced a vast array of new results in heavy ion and flavor physics respectively.

A major milestone on July 4, 2012 was the simultaneous discovery by ATLAS and CMS of the "Higgs" or a "Higgs-like" boson, culminating the 40+ year search for such a particle thought to be responsible for the masses of elementary particles. A typical candidate event in the two photon decay channel, illustrated in Figure 1, is one of several decay modes analyzed for this discovery. One of the next major steps along this generation-long program of exploration is the determination of whether the new particle is the scalar (spin zero, positive parity) Higgs boson of the Standard Model (SM) of particle physics, or an "impostor" with

(Continued on page 14)

(Continued from page 13)

somewhat different properties (spin and other quantum numbers, or its production and decay rates) opening a new era of physics beyond the Standard Model. It is also possible that this *is* the SM Higgs, but its production is modified by the existence of undiscovered heavy new particles that contribute to the gluon-fusion loop diagram that is the dominant production mode.

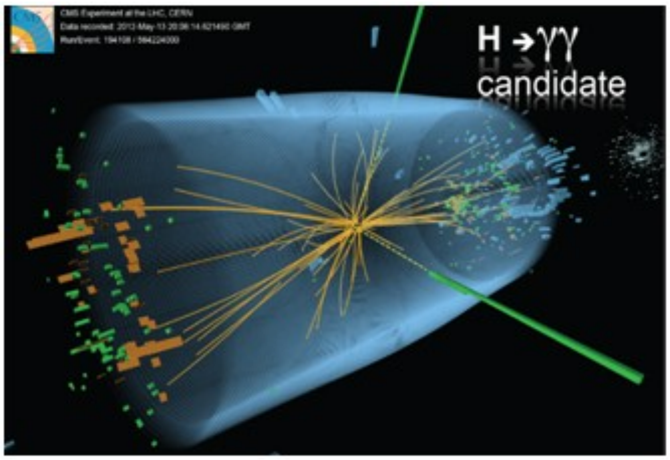


Figure 1 A candidate event for the decay of a Higgs boson to two photons, one of the distinctive modes used for the discovery.

Irrespective of the discoveries to come, perhaps as early as this year as the experiments expect to triple their collected data, physicists already know that the SM is incomplete. It cannot explain the nature of dark matter, for example, nor can it hold at the energies that prevailed in the early universe. The leading candidate alternative theory is Supersymmetry (SUSY), but direct searches have already ruled out much if not most of the SUSY parameter space accessible with 8 TeV collisions, for the simplest SUSY models. And a "Higgs" of mass 125 GeV is difficult to produce in such models. It is nearly "too heavy" to be accommodated, and so particular models with relatively light third-generation SUSY particles, or other models with multiple Higgs particle types or new yet-undiscovered scalar or vector (spin 1) particles have been proposed.

For the next decades, CMS and ATLAS and the other LHC experiments will therefore continue to advance their search for a wide variety of new phenomena that could point the way to that more fundamental theory.

In addition to the higher energies that will bring greater physics reach, when the LHC moves to 13-14 TeV in 2015 and onward, there are many other keys to the search and future discoveries: more sophisticated algorithms to cope with the increasingly severe conditions of "pileup" from multiple interactions in a single crossing of proton bunches in the LHC collider and the increasing radiation exposure of the detector elements as the LHC luminosity and energy increase, and the means to cope with ever larger data volumes and more massive computing and networking needs.

Until now the computing challenges have been met successfully, after years of preparation and field-testing, by the Worldwide LHC Computing Grid (WLCG), which provides access to the Open Science Grid (OSG), EGI and NorduGrid; the LHC experiments have seamlessly combined the resources of more than a hundred computing centers around the globe. On average, a few hundred thousand jobs run simultaneously, accessing hundreds of petabytes of deployed storage worldwide and utilizing hundreds of gigabits/sec of network bandwidth using a hierarchical grid model depicted in Figure 2. Scientists access these computing resources transparently through distributed computing systems developed by their collaborations. These distributed software systems are highly flexible and are evolving to meet the needs of thousands of physics users, in many cases by investing them with increasing degrees of intelligence and an increased level of communications performance.

Even though the distributed computing model for the LHC experiments has proven to be extraordinarily successful, we anticipate that the software stacks will need to be replaced within the next few years. The current system will not scale to the complexity and challenges of exabyte-scale data. Human resources needed to operate the hardware and software infrastructure cannot be linearly scaled tenfold along with the data. There are still many barriers to efficient data intensive scientific computing that need to be overcome. The revolutionary changes for the new distributed computing model need to start immediately, to be ready for LHC data-taking at

(Continued on page 15)

(Continued from page 14)

the design energy in 2015 and beyond.

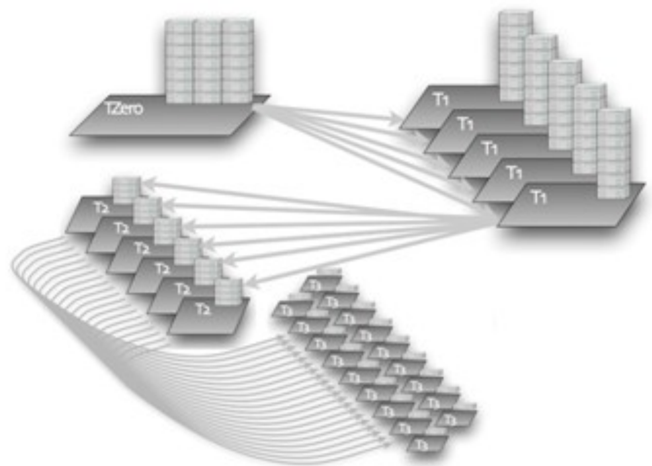


Figure 2: Traditional hierarchical model of the first generation WLCG as the LHC went into operation. Computing resources and data channels follow a tiered organization expressed in a grid paradigm, with strict service roles provided at and between each level of the hierarchy. This model has recently given way to a more agile data access and transport model with a richer set of wide area connections among sites in different layers and in different world regions.

Sophisticated and robust statistical methods have been developed and used to tease out and fairly gauge the appearance of significant new physics signals from large and potentially overwhelming backgrounds. These so-far-successful methods will not scale as needed in the latter part of this decade, particularly if and when the first experimental hints of a more fundamental theory of nature break. If signs of a new theory do emerge, then rapidly finding and characterizing it, in a vast space of candidate models with millions of possible decay chains and billions of possible parameter sets, each to be compared in many dimensions to massive volumes of data, will require new artificially intelligent methods and new orders of magnitude of computational power. The output of this program will be a new set of predictions to be tested through a new multi-year round of targeted analyses, in order to pin down the new theory.

Along the way, CMS and ATLAS and the other detectors will undergo major upgrades, which together with larger data volumes and higher collision energies this will provide greater reach in the search for new physics as well as fertile ground to train the next generation of scientists and engineers skilled in one or many disciplines: in new methods of signal extraction and background rejection; in new methods of hypothesis testing and model selection (finding that more fundamental theory in a vast theory and in parameter space); learning to create, operate and harness a new level and scale of grid-based systems and the dynamic networks, monitoring systems and control planes that underpin them; and in developing a new generation of collaboration systems and learning how to use them effectively for cooperative daily work on multiple scales, from small groups working round the clock to daily working meetings to weekly collaboration meetings involving hundreds of sites.

[*] I have been privileged to contribute to the LHC program, and its successes including the recent "discovery milestone" in many ways. Our group in CMS works on Higgs searches, the search for Supersymmetry and many other forms of exotic new physics, as well as the calorimeters that precisely measure electrons, photons, jets and missing energy transverse to the beam line, and the trigger that makes online decisions on which events to keep in real time. Beyond that our Caltech team has created or made central contributions to major elements of "cyberinfrastructure" including: the initiation of international networking for HEP from 1982 on, and US LHCNet since 1995; the LHC worldwide Computing Model from 1998, the EVO (Enabling Virtual Organizations) global collaboration system since 1994; the MonALISA monitoring and control system since 2000; and the NSF-funded DYNES dynamic circuit network project being deployed at 50 campuses as well as the LHC Open Network Environment LHCONE program since 2010.

Harvey Newman (newman@hep.caltech.edu) is a Professor at Caltech, a high-energy physics experimentalist and past Chair of the FIP. He is also engaged in work on Digital Divide issues in many regions of the world.

Fang Lizhi: An Appreciation

Jim Williams

Fang Lizhi, the Chinese astrophysicist and political dissident, died on April 6, 2012, in Tucson, Arizona. He left China in 1990, after a year spent inside the US consulate in Beijing. Fang and his wife had gone to the consulate for refuge following the violent suppression of the 1989 democracy movement, which the Chinese authorities accused him of fomenting. In 1992 Fang took a position teaching physics at the University of Arizona, where he worked until the time of his death at age 76. He never returned to China.

Fang Lizhi's life story is remarkable, and provides a unique window into recent Chinese history. He was born in 1936 in Beijing, where his father was an accountant for the national railroad. He grew up under the Japanese occupation, and joined an underground Communist youth organization during the Nationalist interlude. At the age of sixteen, Fang was admitted to Beijing University (colloquially known as Beida) in physics, the premier department in China's premier university. Fang's professors included many of China's top foreign-educated physicists, who also served as government advisors and research institute directors. While at Beida, Fang was admitted to the Communist Party, and met physics classmate Li Shuxian, his future wife. He graduated at the top of his class in 1956 and was assigned to the Chinese Academy of Sciences (CAS) Institute of Modern Physics, where at age 21 he led a team doing calculations – sometimes by abacus, in the absence of computers – to optimize nuclear reactor design for production of plutonium for weapons.

In May 1957, during the Hundred Flowers movement, Beida became ground zero for criticisms of the Party. Physics students played a leading role, due partly to their prestige and partly to their privileged access to foreign news sources, which made them aware of events in the Soviet bloc such as Khrushchev's criticism of Stalin and the Hungarian uprising. Though he had graduated, Fang was frequently on campus visiting Li Shuxian, who had been posted there after graduation as a translator for a Soviet expert. The two took part in the Hundred Flowers criticisms, and as a result became targets the following month when Mao Zedong reversed course and launched the Anti-Rightist campaign. Li was labeled a rightist, dooming her physics career. Fang avoided the worst consequences simply because the Party required CAS to purge five percent of its personnel as rightists, and this quota was met before Fang's activities came to light. Nonetheless, he was removed from classified weapons research and expelled from the Party.

The Anti-Rightist campaign was the beginning of a twenty-year odyssey during which Fang, like many other Chinese scientists and intellectuals, sought to pursue a career and raise a family in the midst of political upheaval and frequent assignments to manual labor in China's hinterland. At various times Fang grew millet, raised livestock, planted trees, dug railroad tunnels, and worked in electronics and camera factories. He was reassigned to a teaching position at the newly formed Chinese University of Science and Technology in Beijing (CUST), and was also able to unofficially join the CAS Institute of Physics research team that built China's first laser. While his political status prevented him from publishing articles using his CUST affiliation, he slipped through the cracks of official censorship by using his informal affiliation with the Institute of Physics, and despite his manual labor stints became one of the most widely published physics researchers in China in the early 1960s. Fang and Li married in 1961

(Continued on page 17)

(Continued from page 16)
in the depth of the post-Great Leap Forward famine and had their first child in 1963. During the Cultural Revolution, students on the CUST campus engaged in violent confrontations wearing makeshift armor. Fang stayed clear of the fray initially but was denounced during the Purify the Class Ranks campaign in 1968, and sentenced to confinement in a "cowshed" dormitory room with other professors for a year, during which time 10 of his colleagues committed suicide. In 1969, as part of the "third front" mobilization that relocated strategic assets into China's interior, students and faculty physically moved CUST to its new home in Hefei, Anhui. Fang was later part of a work team that made the bricks from which the new CUST campus buildings were constructed.

A pivotal point in Fang's life and career came during a 1969 assignment to a May 7th cadre school in Huainan, Anhui, where his responsibilities included mining coal and carting the dead victims of the campaign against May 16th elements (a conspiracy later shown never to have existed) in a wheelbarrow to the morgue. While deep in the coal mine, Fang heard bitter complaints by ordinary miners who felt victimized by Mao and the Communist Party. This was a political epiphany for Fang, who up to that point had retained hope that the Party's policies were at least benefiting the majority of peasants and workers. After a day's work in the mine, Fang would hide beneath the mosquito netting in his dorm and read a secreted copy of the Soviet physicist Lev Landau's text on classical field theory, which led to a fascination with general relativity and cosmology. As Fang later described it, "during those months Landau's book became my... only sustenance. When night fell and I lay in my netting exhausted from the day's labor, my soul would roam the expanding universe... It was from this time that I fell in love with astrophysics."

In 1972, as Nixon's visit to China led to a rapprochement in the U.S.-China relationship, scientists returned from manual labor to the lab, and scholarly journals resumed publication. In December, Fang became the first Chinese physicist to publish a research article on modern relativistic cosmology, and specifically Big Bang theory. Fang's article was technical and straightforward, but its political context was not. Einstein and the Theory of Relativity had been strenuously denounced in China during the Cultural Revolution; the substance of this campaign drew heavily from similar campaigns under Stalin in the 1930s and 1940s. As a result, even though as Fang said "there could not have been more than one hundred persons in China who really understood relativistic cosmology," his article became a centerpiece of the factional struggle surrounding Mao's succession, in which the Maoist left accused the pragmatists associated with Zhou Enlai and Deng Xiaoping of pursuing reactionary policies in science – "the satellites may fly to the sky, but the Red Flag falls to the ground." From early 1973 until Mao's death in 1976, at least thirty articles criticizing Big Bang theory in general and Fang's paper in particular were published by the Maoist left in the national news media (including *People's Daily*) and in academic journals. The thrust of the criticism was that Big Bang cosmology contradicted the dialectical materialist doctrine of the infinite universe contained in such Marxist-Leninist classics as Engels's *Anti-Dühring* and *Dialectics of Nature*, and Lenin's *Materialism and Empirio-Criticism*.

Fang stood his ground in the face of these attacks, publishing several new papers arguing that recent developments such as radio-telescope observations had created an empirical basis for cosmology to be studied through the usual methods of science, rather than through philosophical discourse. The campaign against the Big Bang had the unexpected result of allowing Chinese astronomers to hold scientific conferences to conduct "mass criticism"; under this pretext, nationwide astronomy meetings were resumed in 1974, and Fang's resistance became widely known among China's scientific community. A showdown of sorts occurred at a national astronomy conference held at CUST in the summer of 1976, after Deng was purged and his "Outline Report" on science policy attacked by the resurgent Maoist left. With representatives of the Party's ideology departments attending, senior Chinese astronomer Dai Wensai declared publicly that he supported Big

(Continued on page 18)

(Continued from page 17)

Bang theory. The threat of repercussions for the conference leaders ended when Mao died in September and the Gang of Four were arrested a month later.

In the post-Mao era, Fang's scientific career blossomed. He published prolifically and became China's youngest full professor in 1978, a CAS academician in 1981, president of his professional society in 1983, and vice-president of CUST in 1984. He traveled abroad extensively to take up visiting scholar positions and establish scientific relationships between foreign and Chinese institutions; his first trip to a scientific conference in 1978 was so novel that his departure required direct approval from Hua Guofeng, Mao's interim successor. His CUST Center for Astrophysics was in turn visited by foreign luminaries such as Cambridge physicist Stephen Hawking, who complimented the center as being "state of the art in astrophysics and cosmology." Fang also participated in the de-Maoization of science, writing articles about the Cultural Revolution experiences of Chinese scientists that were sharply critical of political and ideological repression, likening Chinese cosmologists to Galileo and their Maoist oppressors to the Inquisition. For a time, these criticisms were compatible with the aims of the Dengist leadership, who wanted to normalize and reward scientific work in support of their technology and economic goals. But a chasm eventually developed between the authorities, who criticized the Cultural Revolution's chaos and privation in order to bolster the Party's political monopoly and economic development focus, and Fang, who criticized the Cultural Revolution's tyranny and mind control as an argument for intellectual and political freedom. Publicly contradicting Party theorists such as Hu Qiaomu, who insisted that dialectical materialism continue to play a "guiding role" in scientific research, Fang said bluntly that Marxist philosophy was useless to science, claiming (some would say gleefully) that he could find a scientific error on every page of Engels's *Dialectics of Nature*.

As the 1980s unfolded, Fang's public critique of Chinese politics and culture extended far beyond the realm of scientific research. He charged that the greatest obstacle to China's development was not "material shortcomings" that could be bridged through "purchases and acquisitions," but rather "cultural traditions and habits of mind." In contrast to the official scientism of the Party's modernization drive, Fang argued that the greatest value of science was not as a technical discipline in the service of a technocratic state, but its role as a "cornerstone of modern thought." Fang almost single-handedly revived the May 4th movement theme of "science and democracy," which many early-20th century intellectuals, including Chinese Communist Party (CCP) founder Chen Duxiu, had embraced as guiding principles for China's modernization. The Party's "Four Modernizations" campaign, by contrast, aimed far too low: "In the beginning we were mainly aware of the grave shortcomings in our production of goods, our economy, our science and technology, and that modernization was required in these areas. But now we understand our situation much better. We realize that grave shortcomings exist not only in our 'material civilization' but also in our 'spiritual civilization' — our culture, our ethics, our political institutions — and that these also require modernization." For Chinese intellectuals, Fang told students, modernization started with "straightening our bent backs" and speaking truth to power. He set a clear example, speaking plainly, criticizing leaders by name, and shining a spotlight on corruption and malfeasance. When asked by a reporter if his "four principles of academic freedom" might be seen as contradicting the regime's "Four Upholds" (the socialist path, dictatorship of the proletariat, CCP leadership, and the leading role of Marxism-Leninism-Mao Zedong Thought), Fang responded: "Is it possible that science, democracy, creativity, and independence are in conflict with the Four Upholds? If so, it's because the Four Upholds advocate the opposite of science, which is superstition; the opposite of democracy, which is dictatorship; the opposite of creativity, which is conservatism; and the opposite of independence, which is dependency."

Fang's themes featured prominently in street protests by college students against corruption and rigged local elections in late 1986. Though he worked behind the

(Continued on page 19)

(Continued from page 18)
scenes to urge the students to return to their campuses, the Party's crackdown on the protests required official scapegoats, and Fang, journalist Liu Binyan, and writer Wang Ruowang were chosen. The Anti-Bourgeois Liberalization campaign had a paradoxical effect: as 500,000 copies of his selected writings and speeches were disseminated to Party branches throughout the country for study and criticism, Fang gained a much wider audience and became a folk hero. He was removed from his CUST post and transferred to the Beijing Observatory, but efforts to control or silence Fang invariably came back to embarrass the Party. Revoking Fang's travel privileges resulted in a torrent of international protest, including a letter from fellow physicist and dissident Andrei Sakharov.

In January 1989, Fang sent a hand-written note to Deng Xiaoping, asking for the release of Democracy Wall activist Wei Jingsheng and other political prisoners. (Wei said recently, "My gratitude to Fang remains immense… for the person whom Deng Xiaoping hated most to openly offend the dictator required enormous courage.") Fang's note in turn precipitated two open petitions of support from prominent intellectuals, including the senior nuclear weapons physicist Wang Ganchang. In March, authorities used heavy-handed tactics to prevent Fang from attending a barbecue to which he had been invited by visiting U.S. president George Bush, focusing worldwide media scrutiny on human rights violations in China. In the democracy protests that erupted spontaneously in April and May of 1989 following the death of Hu Yaobang, Fang avoided playing a direct role, concerned that his involvement would provide a pretext for the authorities to suppress the movement. His views, however, remained influential among the protesters; Beijing University students wore shirts with the legend "science and democracy." After the tragedy of June 4th, Fang and his wife were placed at the top of the public enemies list. At the urging of friends they took refuge in the U.S. Embassy in Beijing, where their presence became an impediment to the normalization of relations between the U.S. and China for more than a year. After lengthy negotiations, Fang and Li were released, and following stays in Cambridge and Princeton, ultimately settled in Arizona.

In exile, Fang remained engaged with China, participating in human rights campaigns, giving talks and interviews, publishing articles, and writing letters on behalf of political prisoners. He worked with many organizations including Human Rights in China, the International League for Human Rights, the Committee of Concerned Scientists, and the Committee on International Freedom of Scientists. He received honors for both human rights and scientific work, and was named a fellow of the AAAS and the American Physical Society. He retained his passion for science, and for teaching science and training young people. Of the 340 scientific journal articles, book chapters, and conference papers in his *curriculum vitae*, more than half were published between 1990 and 2012, an average of about eight papers per year. He worked with more than 125 co-authors, served on international scientific committees, helped to organize major conferences, and continued to build linkages between China and the rest of the scientific world, including the Beijing-Arizona-Taipei-Connecticut (BATC) survey project, one of China's most significant collaborations in astronomy.

Fang's research focused on the structure and evolution of the early universe, the formation of galaxies, and the role of dark energy and dark matter. The range of phenomena he was conversant with was extremely broad, from quantum processes to the expansion of the universe. The bulk of his papers might best be characterized as observational cosmology, in that they took the limited data available from astronomical observations – mostly, the spectral lines of light emitted eons ago from impossibly distant objects – and applied many kinds of rigorous mathematical analyses to them, to tease out the patterns and test which theoretical models were consistent or inconsistent with the data. One of Fang's great skills in science was to recognize the patterns and underlying dynamics of the universe given the observed data, and then to explain it to people in a very simple and direct way. This was perhaps his greatest skill as an observer of Chinese society as well.

(Continued from page 19)

The death of a hero in exile is as tragic in real life as in mythology, and there is immense pathos for those who admired Fang to realize that he will never return home. Yet he did not pass quietly into obscurity, he did not become bitter, and he did not lose his humility, his honesty, his sense of humor, or his passion for the things he cared about. These are great triumphs in the midst of a tragic situation. For China on the other hand, the tragedy of Fang's exile – and the exile and imprisonment of others like him, from Wei Jingsheng to Liu Xiaobo, who have spoken with a clear voice and without fear about the observable reality around them – is not mitigated by its emergence as a superpower. Since Fang's path and China's path diverged in 1989, there has been prodigious progress in China's material modernization, but not in its political culture, evidenced most recently in the Bo Xilai affair's exposure of corruption, cynicism, and lack of accountability within the Party's highest ranks. This is unlikely to change until the spirit of truth-telling that Fang Lizhi embodied is finally invited home to a hero's welcome.

Jim Williams is an Associate Professor at the Monterey Institute of International Studies and Chief Scientist, Energy & Environmental Economics, in San Francisco.

PASI2012 - Exploring the Terascale and Beyond

Marleigh Sheaff

The University of Buenos Aires played host to this Pan-American Advanced Studies Institute from March 5 through March 16 of this year. The three frontiers along which particle physics must advance in order to answer the many questions still outstanding in this field, the Energy, Intensity, and Cosmic Frontiers, provided the theme for the multidisciplinary program. While the fields of particle physics and cosmology could be treated as separate fields some twenty years ago, it is clear by now that they are closely intertwined and advances in either one inform the other.

Thirty-two post docs and advanced graduate students, eighteen from institutions in the United States and thirteen from institutions in five countries in Latin America participated through an award made by the PASI program supported jointly by the National Science Foundation and the Department of Energy. The PASI award leveraged additional support from Brazil, Chile, and Argentina that allowed an additional 42 students from those countries to take advantage of this unique educational opportunity. The student participants from all countries were outstanding, which made for a very worthwhile and intellectually stimulating activity. Approximately half of the advanced graduate students

(Continued on page 21)

(Continued from page 20)

who participated were local, which reflects the high-quality of particle physics education in Argentina.

The international organizers, most of whom lectured at the institute, came from the U.S. and three different countries in the Southern Hemisphere. The U.S. members were Marleigh Sheaff, Chair, and Daniel Chung, both of the University of Wisconsin-Madison, and Marcela Carena of Fermilab and the University of Chicago. They were assisted by three professors from Latin America, Gustavo Burdman of the University of Sao Paulo in Brazil, Marco Aurelio Diaz of the Catholic University in Santiago, Chile, and Daniel de Florian of the University of Buenos Aires. De Florian also acted as chair of the local organizing committee.

The lecture courses covered a broad range of topics on three frontiers:

Energy Frontier

Kirill Melnikov, Johns Hopkins University, Quantum Chromodynamics
Sekhar Chivukula, Michigan State University, The Quest for Electroweak Symmetry Breaking
Elizabeth Simmons, Michigan State University, Strong Dynamics
Aurelio Diaz, Catholic University in Santiago, Chili, Higgs Physics at Colliders
Cecilia Gerber, University of Illinois - Chicago, Experimental Methods in Hadron Colliders
Marcela Carena, Fermilab, Supersymmetry
Gustavo Burdman, University of Sao Paulo, Brazil, Extra Dimensions

Intensity Frontier

Boris Kayser, Fermilab, and Renata Zukanovich Funchal, University of Sao Paulo, gave an interleaved set of lectures on Neutrinos - Theory and Phenomenology
Andre de Gouvea, Northwestern University, Fundamental Physics with Muons and Related Topics

Cosmic Frontier

Daniel Chung, University of Wisconsin, Introduction to Cosmology
Leonardo Senatore, Stanford University, Inflation, CMB
Graciela Gelmini, University of California - Los Angeles, Astroparticle Physics - Dark Matter.

In addition to this advanced series of multidisciplinary lecture courses augmented by discussion sessions at which the students could clarify their understanding through detailed answers to their questions, there were many student talks and posters as well as a special one-day session highlighting experiments sited in Latin America. The full program can be viewed on the PASI2012 web site, "http://www.hep.wisc.edu/~sheaff/PASI2012".

The PASI award provided support for all lecturers including Arnulfo Zepeda of CINVESTAV, Mexico City, who gave the keynote address at the special one-day session.

Zepeda is a member of two of the three experiments highlighted in this program, AUGER (Argentina), DES (Chile), and HAWC(Mexico). Special thanks are due to the physicists who volunteered their time to present detailed seminars on the experiments:

Carola Dobrigkeit of UNICAMP, Brazil, Recent Results from the Pierre Auger Observatory
Federico Sanchez, ITeDA and CNEA, Argentina, Non-Thermal Cosmic Messenger Experiments: Auger, CTA, ANDES
Martin Makler, CBPF and LIneA, Brazil, Mapping the Universe: the Dark Energy Survey, Status and Plans
Miguel Mostafa, Colorado State University, The High Altitude Water Cerenkov Observatory

The special session included a presentation by Sergio Novaes on collaborations between Brazil and other countries, many of them outside of Latin America, entitled Brazil and the LHC: A Personal Perspective. His presentation gave many details, including a list of col-

(Continued on page 22)

(Continued from page 21)

laborations of the various institutions in Brazil with others world-wide on all four experiments at the Large Hadron Collider at CERN. He also discussed how collaboration in particle physics has leveraged support in Sao Paulo State for a wide-ranging computer grid extending to the institutions of higher learning throughout the state, which is available for research in all the sciences.

Carlos Garcia Canal, a well known Argentine particle theorist from the National University in La Plata, organized a round table on Collaborations as a wrap-up of the day's activities. Two U.S. students gave short presentations at this round table. Both had applied for and been awarded grants that allowed them to travel to Latin America to work with colleagues there. Amanda Yoho, a graduate student at Case Western Reserve in Cleveland, traveled to Brazil for a short-term visit, Zigried Hampel-Arias, a graduate student at the University of Wisconsin, obtained a Fulbright fellowship that supported him to work for one year in Argentina on the Auger experiment with the group in Bariloche. A major discussion point at the round table was the stated wish of all who took part for a consistent source of funding for scientific research.

Marleigh Sheaff is a Senior Scientist Emeritus in the Physics Department at the University of Wisconsin.

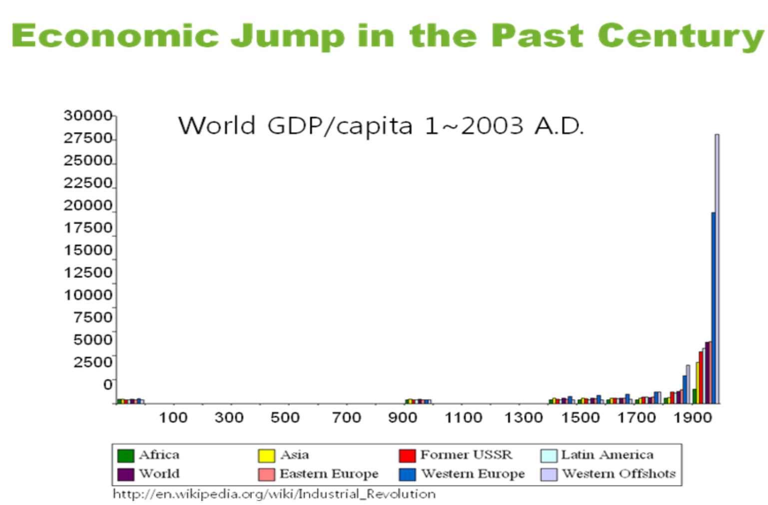
Korean Contribution to the Progress of Science and Humanity

Dong-Pil Min

Note added by the Editor. William Barletta, FIP Chair, submitted the text of this important invited talk by Professor Min for inclusion in our newsletter. This is a lightly edited version of the presentation in session H4 at the April Meeting. The text will be enhanced by having the visuals in front of you as you read it.

http://absuploads.aps.org/presentation.cfm?pid=10344

Werner Heisenberg, one of the founding fathers of quantum mechanics (QM), once predicted that science had to play the role of the driving locomotive of modern civilization covering not only the western countries but also the whole world, east and west, south and north. The world today is much wealthier than a century ago mainly thanks to QM. (See the figure from Wikipedia on the Industrial Revolution.)



However, science has not yet solved the urgent and prominent issues we actually encounter today to make our world safe and sustainable: climate change, water, energy and health, to name a few. Moreover, the benefits of scientific knowledge are not yet readily available across the globe as is shown in the figure. The distribution of wealth, i.e., the benefits of scientific knowledge, has become an urgent issue to be resolved. I'd like to focus on one area of efforts by Korea in creating and sharing knowledge. The reason why I chose this subject is not purely to advertise the Korean endeavor, but to emphasize that the world needs much intelligence and collective atten-

(Continued on page 23)

(Continued from page 22)

tion to move toward a better world. I want to concentrate on what scientists can do to contribute to the expansion and distribution of knowledge, and therefore, to contribute to finding answers to global issues. And I will introduce which direction Korea wants to pour its efforts. I believe strongly that the progress of science should go hand in hand with the progress of humanity.

Low Carbon Green Growth and Knowledge Sharing

In recent years, our attention has focused on how to encourage humans to convert from a brown economy to a green economy, that is, towards sustainable development while keeping our environment healthy. For such a conversion to succeed, not only a few countries but the entire world must participate. Not only a specific discipline but also whole disciplines should collaborate. To shed light on the solution to the energy, pollution and other problems as well, scientists have a heavy responsibility. They should spend their time and efforts on these issues.

The distribution of wealth and technology is not 'even' yet, and developing countries don't have the wherewithal for cutting edge research and development. Many developing countries focus more on growth by any means, even at the cost of their natural environment. Therefore climate change would not resonate enough in their policy-making. Many advanced countries, however, claim that we should convert to a green economy without considering how to solve the thorny issue of wealth distribution. They may want to achieve the wealth through new technological dominance over the world market. This may be the reason why their claim does not ring true in developing countries. Certainly to solve the climate change problem, the entire world should participate to limit the emission of CO_2. We know that the crises of today affect the entire world. We need to respond by exchanging ideas and sharing knowledge, because what developing countries need is the appropriate technology to make their countries wealthy enough to reconsider CO_2 emission and forestation. It is important to reach a level playing field first to solve climate change.

Unless the present situation is changed, the damage caused by climate change will impact first and foremost the poor living in developing countries. The United Nations Development Program (UNDP) estimated that people suffering from malnourishment will increase to 600 million by 2080 due to declining agricultural output; an additional 1.8 billion people will suffer from water shortage, and 330 million people will be displaced due to climate related disasters such as flooding. Billions of poor people in developing countries are vulnerable to climate-induced risks. We realize that many issues are entangled and connected. Issues like energy and food security, biodiversity, poverty and population change will shape this century. There is no 21st century counterpart of what Quantum Mechanics did for 20th century. A wise voice says that we'll get poorer unless we get smarter. We should think seriously about the links between the creation of knowledge and sustainable prosperity through knowledge sharing.

What is a smart idea? I believe that making the world "flat," as suggested by Thomas Friedman, is a solution or a path leading to a solution.

Science and Technology of Korea

Korea proclaimed that green growth is the national objective, a new paradigm and a new coordinate of economic activities. This is since 2009. Korea has been running to catch up with other developed countries and to join in world efforts for a sustainable green economy with science and knowledge sharing. This effort of 'science for humanity' may suggest the way to the solution to health, energy, environment, leading ultimately to green growth. Let me discuss how this vision is supported by Korea.

The annual growth of R&D investment reached 3.75% of the GDP in 2011, about 60 billion USD, which is about 50% more than the forecast made in 2004. In terms of R&D investment as a portion of the GDP, Ko-

(Continued on page 24)

(Continued from page 23)

rea ranked 2nd in the world after Israel in 2011. The growth rate of annual publications reached 12%, which translates to 4th in the world. And the brute growth rate of R&D expenditure ranks first among the OECD countries and 5th in the world. IMD, an international evaluation organization, ranks the science and engineering competitiveness of Korea in the world as 3rd and 14th, respectively.

However, publications are not yet penetrating into the world academic society. This means that Korea has not produced enough influential papers yet to be visible. This is the reason why Korea launched an ambitious national project in 2009 to support basic science and to build a solid knowledge ecosystem, to establish a healthy circulation of knowledge among the pure/basic, applied and development research skeleton. This project is called, "International Science Business Belt Project (ISBB)". ISBB includes a plan to construct an accelerator, the Korea Rare Isotope Accelerator (KoRIA). KoRIA will be built in Daejeon City, in the center of South Korea. This signals that Korea is ready to take on yet greater responsibilities as an integral member of the global science community. The goal of this plan is to create an environment conducive to developing a knowledge-based society in Korea for the new millennium, by advancing basic science and technology.

KoRIA is a multi-purpose machine. It includes both ISOL and IFF methods to produce rare isotope beams as well as stable ion beams. Why does Korea want to build this accelerator? It is to:

- participate effectively in world efforts for the progress of science,
- help scientists work across academic disciplines and national borders,
- encourage the intellectual exchanges,
- save resources and invest effectively for the world future facilities, and
- find more effective way to extend the frontiers of natural knowledge.

KoRIA will adopt the universal principles of operation as at other world user facilities. Therefore the operation should be based on the following principles:

- It is for the scientific discoveries.
- It is for users who will contribute to the purpose of the facility.
- It is for the spirit of cooperation.
- It is to respect the intellectual property right.

What can be said with confidence now is that KoRIA will become a truly international venue for the kinds of experiment that will shape the course of scientific exploration. We are soliciting the participation of international researchers and scholars even during the initial planning stages. We will not deviate from this philosophy of joint venture and camaraderie and will steadfastly maintain an open door policy for partnership and mutual cooperation.

Sharing Knowledge by Technology Transfer

Long term prosperity and its sustainability stem from the equity of knowledge. The "flatness" of knowledge is what we should try to achieve first to share its benefits. This is the proverbial 'teach-how-to-fish-rather-than-giving-fish' strategy. When sharing technology, we should also study and know the recipient's society and environment. You do not provide the know-how of sea-fishing to those who have only a small pond, because the knowledge is not appropriate for them. In fact, today's multifarious crises call for an innovative blueprint to improve our existing program of sharing knowledge. To make the program successful, we need to align science and innovation with global challenges and shape them to be appropriate in this context. We may need to have a permanent institution to share knowledge efficiently, to coordinate efforts. The most important factor would be, I believe, how to coordinate our efforts and resources. There are many international organizations that try to do this. But they tend to cover many other issues than focusing on effective transfer of appropriate technology.

Korea is preparing for a green economy future by investing R&D into basic and applied research, especially by increasing the portion of governmental R&D

(Continued on page 25)

(Continued from page 24)

to applied research on green technology. Since 2008, Korea's development strategy to induce ‘low carbon green growth’ has focused on creating more jobs in the sector of green technology and innovation, improving enterprise’s competitiveness, and maintaining efforts without deteriorating the overall quality of life. All OECD countries are more or less running in this marathon. US invests by a higher order of magnitude for 10 years, EU no less, Japan wants to be 3rd by itself, and China is a new strong runner. Indeed, the Korean government is determined to set up a strategy to invest massively to fund the green-growth engine. We are very excited to put a quarter of government R&D investment with a goal to place Korea among the top 7 in the world in green technology competitiveness by 2020, and in the top 5 countries by 2050. Korea wants to invest more in sharing of knowledge with other countries. Also Korea wants to put more emphasis on orchestrated international research efforts to produce collaborative outcomes.

Proposals to Overcome Barriers

However, as for the sharing, we realize that we face some tough barriers. We make some proposals to overcome these barriers.

One of the main obstacles to overcome for technology transfer concerns the issue of intellectual property protection. Although intellectual property right is a delicate issue intertwined with corporate profit, we have recently seen positive trends which include multinational pharmaceutical companies enhancing access to and openness of the research related to neglected tropical diseases. The proposal made by GSK (GlaxoSmithKline) in 2009 is a good example. The company suggested the creation of a relevant patent pool for drugs and manufacturing processes that can be used to develop new treatments, made available free of charge to the world's 50 least developed countries. To overcome the barrier of intellectual property rights, it may be worth establishing an open technology platform from which the least developed countries could draw needed technologies at low or no cost.

The second obstacle is the difficulty to develop appropriate technologies which fit the recipients’ socio-economic conditions. Even if the developed countries provide the knowledge to a southern country which lacks R&D capacity to absorb and use knowledge, without adequate adaptation, developing countries will face difficulty using the technology due to a significant difference in social environment. The technology that is developed, for example, must not be overly expensive to operate in the market of developing countries. The technologies will become useful only by adapting to the characteristics of developing countries. The technology platform may find the knowledge for proper adaptation. However, a sustained collaboration between recipients and donors is required. This collaborative research should be supported. Korea will increase its Official Development Assistance fund from 0.1% of GDP in 2009 to 0.25% in 2015. This should be efficiently employed on the basis of ‘teach-how-to-fish’ strategy.

The third obstacle is from almost the same reason that developing countries have no wherewithal to develop the appropriate technologies. From a long term perspective, we observe that assisting developing countries to build the capacity to develop independently the necessary technology is more effective than transferring technology. We must also consider how to invigorate not only adaptation of northern technology to the south, but south to south transfer of technology as well. For this purpose, we must establish a mechanism to transmit knowledge and to establish training. However, the research support extended by developed countries to the developing countries, in many cases, may be confined to collection of data for articles to be written up by scholars from developed countries. This is known as a 'parachute science support.' Or worse, we observe the phenomenon of brain drain where talents from developing countries are mobilized to solve problems facing developed countries. These are the temptation which should be overcome by developed countries. Korea established an institute, Green Technology Center, to help build the capacity of developing countries

(Continued on page 26)

(Continued from page 25)

in the spirit of equal partnership.

The last obstacle lies in the fact that developing countries are not intimately included in the research network to get access to the most updated information. To achieve the cooperation, even with permitting free use of some technologies, the simple existence of a database is not enough. Instead, they must find ways to maintain the continuous development. For cooperative research support to obtain practical effects, it is crucial to increase the level of mutual understanding from the perspective of a long term partnership. This is why we need a wide and solid network or a platform to help them to evolve for themselves to create the proper business with the appropriate green technology. Korea wants to collaborate with other nations and, for that reason, initiated the establishment of an international organization, Global Green Growth Institute (http://www.gggi.org).

In view of those obstacles and proposals to overcome them, I hope that we can give more effort towards sharing the benefits of global R&D programs. In this context, the programs to overcome obstacles will need to serve as an open platform of appropriate knowledge. The platform can ensure the practical exchange of outstanding human resources, information on socio-economic conditions and on technology availability, as well as sharing of the results to low income countries. Once this program of exchange and sharing is in full swing, I am confident that the end result will be invigorated international development and a healthier global economy. I believe that we need to create a sustained mechanism of technology transfer, named as a 'common technology platform' to which low-income countries shall have free access.

In summary, the 21st century presents us with many challenges. There are environmental issues such as global warming and deforestation, economic issues as eradication of poverty and health issues as pandemics and intractable diseases. These challenges call for concerted and creative efforts by all countries across the world and all experts across disciplines. More specifically, we need to respond by promoting creation, exchange and sharing of new knowledge and ideas. Experts in science and technology, economy, policy making, and other fields must work together to find solutions to pressing global problems. This is why Korea wants to provide an arena where such collaboration can take place. One of such efforts is the establishment of a knowledge platform inside of the Global Green Growth Institute (GGGI). GGGI is established to support developing and emerging countries for green growth development, and to facilitate public and private cooperation. As for the science and technology side, Korea is trying to establish a knowledge platform, called as Common Technology Platform.

I hope that scientists can continue to work together for new discoveries of knowledge and its fair distribution. I ask for your support and cooperation for the Common Technology Platform, as we seek sustainable socio-economic development and answers to global problems.

Dong-Pil Min , DSc, is Professor Emeritus of Seoul National University and Ambassador for Science and Technology Cooperation of the Republic of Korea.

Forum on International Physics Committees

EXECUTIVE COMMITTEE

Chair: William Barletta, MIT, UCLA, Ljubljana
Chair Elect: Sergio Ulloa, Ohio University
Vice Chair:, Esen Ercan Alp, Argonne National Laboratory
Past Chair: Harvey Newman, Caltech
Secretary/Treasurer: Noemi Mirkin, University of Michigan
Councillor: Herman Winick, Stanford University

Members-at-Large:
Eugene Chudnovsky, CUNY-Lehman College
Alberto Santoro, University of Rio de Janeiro, Brazil
Giulia Pancheri-Srivastava, INFN Frascati Ntnl Lab, Italy
Carl Akerlof, University of Michigan
Luisa Cifarelli, University of Bologna
Sultana Nahar, Ohio State University
Ernie Malamud (Newsletter Editor), Univ of Nevada, Reno

Deadline for contributions to Spring 2013 Newsletter is February 15, 2013
Send to malamud@foothill.net

PROGRAM COMMITTEE Sergio Ulloa, Chair

NOMINATING COMMITTEE Harvey Newman, Chair

FELLOWSHIP COMMITTEE William Barletta, Chair

ITGAP COMMITTEE Ercan Alp, Chair

NEWSLETTER COMMITTEE

William Barletta, MIT, UCLA, Ljubljana
Amy Flatten, APS
Efim Gluskin. Argonne
Marleigh Sheaff, Univ. of Wisconsin
Lidia Smentek, Vanderbilt, University