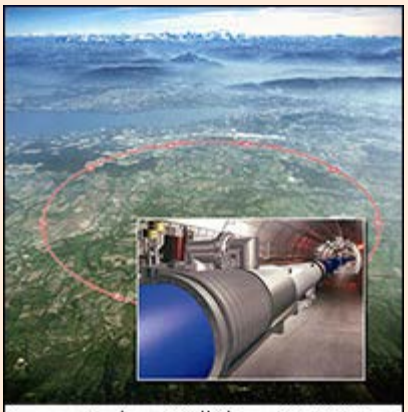
AIP|Matters Monday, November 2, 2009

Director's Matters

Big tools for science

Last week, the Department of Energy sponsored a symposium entitled "Accelerators for America's Future"—a lofty title for a gathering to discuss the impact of investments in particle accelerators. These tools of science, which have existed for almost a century, have had considerable impact on both science and the economy in ways that many outside of the physics community are unaware.

These machines began as small tabletop devices in the 1920s, which were used to accelerate the newly recognized class of subatomic particles (electrons, protons, or charged atoms) to energies of many thousands of volts. As the technology of designing these tools progressed and the energy was boosted past a million volts, the machines became the basic workhorse for the new fields of nuclear and particle physics. In the 1930s, accelerators were first used in medicine as an instrument of radiation therapy for cancer treatment, and within the Manhattan Project in the 1940s, accelerators were essential for underpinning the nuclear physics for the development of the nuclear bomb and the large-scale industrial processes needed for separating uranium isotopes used to fuel the bomb. Since World War II, the design and application of accelerators burgeoned for all three endeavors: science, industry, and medicine.


Large Hadron Collider at CERN in Switzerland.

The science was driven by the push to higher energies—the Tevatron at Fermilab first broke the trillion-volt barrier, and the Large Hadron Collider (LHC) at CERN, which returns to operation next month, is designed to produce protons colliding at energies of 14 trillion volts. Coincident with this evolution for basic particle physics, families of accelerators built across the globe have nurtured other sciences. Numerous dedicated machines are installed in large user facilities for materials scientists to produce intense sources of x-rays and neutrons used to decode the structure of materials or to design new materials. This year's Nobel Prize in Chemistry was awarded to three scientists for unraveling the structure of a key macromolecule, the ribosome. This task required the capabilities of the dedicated x-ray light source at Brookhaven National Lab.

Beyond the science, small medical accelerators—the primary means of targeted cancer therapy—at many hospitals and large regional cancer centers now treat millions of patients every year. Industrial applications underpin the production of all the silicon wafers used in modern electronics and most large-scale sterilization methods for plastics and many foodstuffs. Last year, the manufacturers of small accelerators for medicine or industry generated over $3.5 billion of revenue, which resulted in more than

$50 billion of valued products—not a bad spin-off from machines whose continued design and evolution are predominately confined to the rarefied academic halls of particle and nuclear physicists.

The scientists and engineers who gathered last week in Washington to consider these tools of science pondered several troubling issues. At one end of the spectrum, machines such as the Tevatron and LHC are the poster children of big science, yet the attainment of trillions of volts costs billions of dollars. At the other end, the machines that are used for medicine and industry are based on accelerators that were designed over a half century ago. On the horizon are new classes of accelerators based on boosting particles with plasmas or lasers, which could dramatically shrink the size and, hence, the cost of these machines. The scientists and engineers who have made a career as accelerator designers, and the Department of Energy, the agency that since its inception as the Atomic Energy Commission in 1946 has overseen accelerator development, used last week's symposium to make the case that these tools of science and contributors to the economy will be just as important in the 21st century as they were in the 20th century.

Sincerely,

Fred

Publishing Matters

***PACS* matters**

In early October, AIP published the new edition of the *Physics and Astronomy Classification Scheme*® (*PACS*®) and made the new scheme live in all our publication databases. *PACS 2010* is the culmination of efforts of volunteer experts from several disciplines, who worked collaboratively with advisors from AIP and communicated entirely within a wiki environment set up by AIP staff for this project. During development of *PACS 2010*, a set of working groups drove major revisions to eight *PACS* sections. In addition, minor revisions were incorporated in another 33 sections. *PACS 2010* also features a new section on renewable energy resources and applications. A new design was introduced for the website, which has ushered in the digital-only mode of publication for this important product. Publishers may find out about opportunities for institutional licensing of *PACS* through the site. AIP is grateful to the *PACS* oversight body—AIP's Subcommittee on Classification and Information Retrieval—which is chaired by Elias Greenbaum of Oak Ridge National Laboratory. AIP also appreciates the members of the working groups, which were chaired by Cheng-Ju Lin (Lawrence Berkeley National Laboratory), Allen M. Goldman (University of Minnesota), Paul G. Clem (Sandia National Laboratories), Andreas Mandelis (University of Toronto), Orlando Auciello (Argonne National Laboratory), and Daniel Kulp (American Physical Society). Visit the new *PACS* website for more information about this latest edition.

Physics Resource Center Matters

Visual archives has 17,000 photos online

In October the Niels Bohr Library's Emilio Segrè Visual Archives mounted the 17,000th image on its website. Researchers can now view and order online nearly all of the most valuable and most requested photos from our collection of approximately 30,000 images. These include many shots of the icons of modern physics—Einstein, Bohr, the Curies, Rutherford, Fermi, Heisenberg, and others—plus winners of the Nobel and other major prizes, AIP Member Society presidents, and many other physicists and allied scientists, along with images of equipment and facilities.

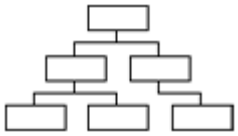
Photo taken June 24, 1915, at the University of Minnesota; Henry Erikson is fourth from left. Also in photo are Anthony Zeleny, Alois Francis Kovarik, Paul Klopsteg, and Earle Hesse Kennard.

Credit: AIP Emilio Segrè Visual Archives, Kilbride Collection

The 17,000th photo shows the University of Minnesota physics faculty and staff in 1915. It was donated by Susan Kilbride, the great-great-granddaughter of Henry Erikson, who was department chair from 1915 to 1939. Erikson is known for research on the ionization of gases. In an oral history interview in the Niels Bohr Library and Archives, Merle Tuve said that in the early 1920s "I'd been a teaching fellow for two years, starting even before I had my bachelor's degree. Old Professor Henry Erikson said, 'Don't tell anybody you haven't got your bachelor's degree. But we know you know the stuff, so you can go ahead and have this fellowship.' They paid $650 a year at that time."

Around AIP

Who we are—Business Systems and Operations Infrastructure and Communications



The AIP Business Systems and Operations (BS&O) Infrastructure and Communications group (see the organizational chart, pages 12 and 15) is directed by Joel LaCalamita. This team is responsible for the planning, implementation, and management of a reliable and scalable network and server infrastructure for the Melville Publishing operations. The scope of this infrastructure spans three data centers and supports internal services such as e-mail, Informatics and Production, MACS, Oracle Financials, and more public-facing services such as Scitation, AIP UniPHY, and our corporate website. Internet connectivity, network security, network access (wired/wireless), and VPN are major network components. A virtual server infrastructure with more than 100 servers in production underlies many critical services like Oracle database, file/print, and e-mail. Provisioning and system administration for the Microsoft, Solaris, Linux, and Netware servers running on the virtual infrastructure are also provided.

User Services and Support in Melville also reports to LaCalamita and provides Help Desk support, setup and maintenance of desktop equipment and applications,

web/voice/video conferencing, office automation support, and desktop virus protection and security. On average, the Help Desk responds to more than 300 calls each month, including the setup and teardown for 11 conference rooms. This group also maintains and supports various production applications and servers such as Asura, SpeedFlow, Sicuriq, and PitStop.

BS&O Infrastructure and Communications staff, from the left: Tim Johnston, Romeo Santiago, Robert Masi, Ronald Tadeo, Michael Piraino, Daniel Asquino, Andrew Jack, and Joel LaCalamita.

Member Society Spotlight

The Society of Rheology enjoyed record-smashing attendance at their 81st annual meeting in Madison, WI, October 18–22. The 470 registrants toppled the previous record, set in 1999 at 367 registrants, thanks to the efforts of the several committed volunteers and local arrangements committee chair Jeff Giacomin. AIP was pleased to take part in the excitement by offering a preconference industry/faculty/student mixer, themed "Industrial Applications of Rheology" and chaired by Cathy O'Riordan, vice president of Physics Resources. Sponsored by the AIP Corporate Associates, the session featured a panel of scientists whose research has industrial applications, either proven or potential, to rheology in the commercial sector. Among those invited were representatives from local science and technology companies, professors and students from area physics and chemical engineering departments, and meeting registrants. The ultimate goal for AIP Industrial Outreach was to help participants forge relationships and explore ways to collaborate on future initiatives.

Applied rheology panelist Jeff Morris (left) converses with Cathy O'Riordan and another forum participant.

The panelists—Norman Wagner of the University of Delaware, Gerald Fuller of

Stanford University, Dan Klingenberg of the University of Wisconsin–Madison, and Jeff Morris of the City College of New York—discussed their extensive collaborations with industry. These partnerships were based on research involving such diverse topics as shear thickening in military applications, petroleum and biofuels, therapeutics, and magnetorheology with automotive applications. Wagner's presentation was a prelude to his plenary talk on shear thickening in colloidal dispersions. The timing of his presentation to the SOR community could not have been better—Wagner and *Journal of Rheology* editor John Brady authored a feature article in the October issue of *Physics Today*, which reached the hands of 120,000 physical scientists around the globe, a mere fortnight before the start of the SOR meeting.

Faith Morrison (right) and Cathy O'Riordan at the joint *Journal of Rheology* and *Physics of Fluids* booth in the SOR meeting exhibit hall.

Manager of Member Society relations Liz Dart Caron attended the SOR executive committee meeting and reported on AIP's newest offerings, including the AIP UniPHY networking site for researchers. Caron also managed a joint booth for SOR's *Journal of Rheology* and AIP's *Physics of Fluids*. Due to the success of the exhibit, the two journals will team up again for a joint booth at the APS Division of Fluid Dynamics meeting later this month.

At the close of the meeting, president Robert Prud'homme passed the leadership reins to Faith Morrison of Michigan Technological University. Jeff Giacomin of the University of Wisconsin–Madison assumed his new role as vice president.

We invite your feedback to this newsletter via e-mail to aipmatters@aip.org.

For past issues of this newsletter, visit the AIP Matters archives.