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Scientists Help with Art Conservation
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APS Elections Now Open

APS general election voting began on May 15 and is open until the end of June. Members can cast their vote for vice president, the chair-elect of the Nominating Committee, international councilor, and general councilor.

The vice president is the entry point in the presidential line, and assumes the role of president in the third year of service. Running for vice president are Laura Greene from the University of Illinois at Urbana-Champaign and Margaret Murnane at the University of Colorado.

The chair of the Nominating Committee serves three years on the committee, first as chair-elect, the second as chair, and lastly as past chair. The Nominating Committee selects candidates for the presidential line, chairs of the Nominating Nommittee, and international and general councilor. The candidates for the chair of the Nominating Committee are Paul Chaikin of New York University and Anthony Starace of the University of Nebraska-Lincoln.

The international councilor is a member who resides outside the US and sits on the APS Council, the Society's main governing body. The candidates are Eliezer Rabinovici of the Hebrew University of Jerusalem and Yifang Wang from the Institute of High Energy Physics in Beijing.

The general councilor is elected by the whole membership and sits on the Council. Running for general councilor are Gail McLaughlin of North Carolina State University and Sherry Yennello of Texas A&M University.

Members have been sent an email with instructions on voting. The candidates' full statements are available at the APS election website; to vote, members can go to the APS homepage (and log in).

Proposed Changes to APS Governance

On the Back Page of this issue (p. 8), APS President Malcolm Beasley outlines a proposal put forth by the ad hoc APS Committee on Corporate Reform to change the way APS is governed, including

- Eliminating the present Executive Board and replacing it with a Board of Directors made up of the Presidential Line, nine council members including a Speaker of the Council, and the member-elected Treasurer. The APS President would chair the Board. As required by DC law, the Board would be the ultimate governing authority with overall fiduciary responsibility, strategic planning responsibility, and oversight of the executive.

- Repurposing the present Council into a Council of Representatives chaired by the President-Elect, with a Speaker of the Council managing the Council's work. The Council would be delegated full responsibility for all matters of science and science policy.

- Restructuring the present executive triumvirate of Executive Officer, Treasurer/Publisher, and Editor in Chief. A new position of Chief Executive Officer would be created to oversee day-to-day operations of the Society and to be responsible for overall coherence in APS operations.

A form for member comment and background information are available at the ad hoc APS Committee on Corporate Reform website: www.aps.org/about/reform/

Physicists Widen the Search for Dark Matter Particles

By Michael Lucibella

After years of null results in the search for dark matter, physicists have started pursuing more exotic and expansive theories about what makes up most of the mass of the universe. For many physicists, the idea of a solitary dark matter particle seems outmoded, and they have ramped up their intellectual and experimental searches accordingly.

"It may be a little naïve to believe that the dark sector is only one particle," said Blas Cabrera of Stanford University, one of the researchers in the large Cold Dark Matter Search (CDMS) collaboration. "We're covering all the bases rather than focusing on the one that seemed attractive a decade ago."

Searches continue for theoretical particles like axions, which have been dark matter candidates for some time. But scientists are also talking more and more about the possibility of a whole "dark sector." This is the concept that dark matter isn't necessarily composed of a single particle, but rather is made up of a menagerie of invisible particles and forces.

"Instead of thinking of it as a theory, I would think of it as a class of theories," said Dan Hooper of Fermilab. "This would be a dark matter sector…not just a particle, but a series of particles that interact...."

At the 2014 APS April Meeting, talk of the dark sector took center stage at the Fred Kavli Keynote Plenary Session, where Rafael Lang of Purdue University highlighted

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CDMS Collaboration

Researchers are starting to expand the search for dark matter candidates.

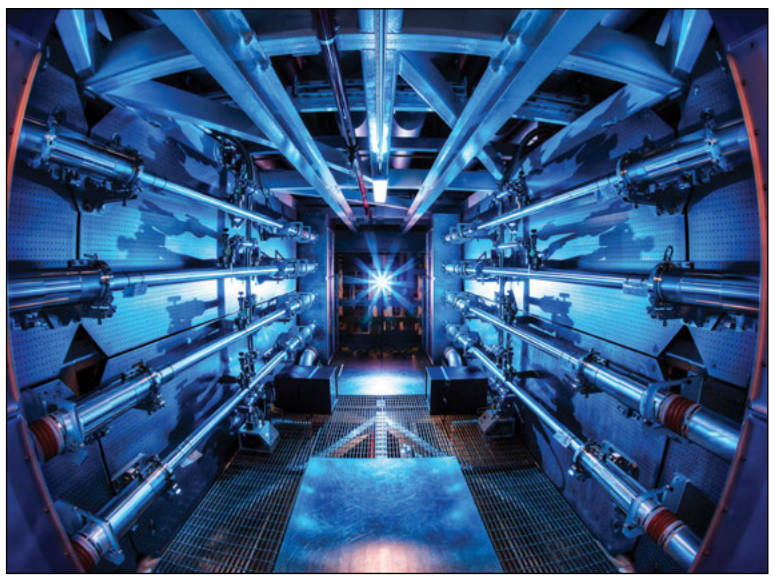
More Basic Research at the National Ignition Facility

By Michael Lucibella

Recent changes at the nation's top large laser facility are making it easier for scientists to do basic research there. Though still primarily focused on fusion and nuclear weapons research, the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory is becoming more of a user facility.

"There's been a real sea change at NIF for the better in terms of the fundamental science program," said Don Lamb, chair of the NIF users group. "It's a transformation of what NIF can do for the scientific community."

Completed in 2009, NIF's primary missions are to simulate nuclear weapon detonations as part of the Department of Energy's (DOE) "Stockpile Stewardship" program and to develop laser fusion to generate electricity. NIF concentrates



Lawrence Livermore National Laboratory

Brighter days ahead–outside researchers will get more time at one of the largest laser facilities in the world.

192 powerful lasers onto a 0.5 cm diameter pellet of hydrogen, compressing it and igniting nuclear fusion reactions. The energy program's ultimate goal is to get more

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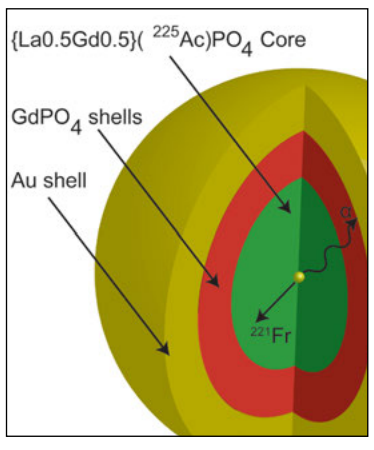
Alpha Particles Target Cancer

By Calla Cofield

In May 2013, the Food and Drug Administration (FDA) approved the first cancer treatment drug containing an alpha-emitting isotope. At the 2014 APS April Meeting, J. David Robertson, professor of chemistry at the University of Missouri, discussed a new technique that involves embedding alpha emitters inside a layered, gold-coated nanoparticle to make them safe for treatment for even more types of cancer.

Endoradiotherapy is a form of internal radiation therapy in which a radioactive substance is ingested by or injected into the patient. Until last year, the radioactive isotopes used in endoradiotherapy were beta emitters (those that release electrons or positrons). While surgery is usually the best option for sizeable, isolated tumors, chemotherapy is



J. David Robertson/University of Missouri

Nanoparticle layers surrounding an alpha emitter

utilized to destroy small groups of cancer cells (or "micrometastases") in multiple locations.

Endoradiotherapy drugs offer a targeted alternative to chemotherapy for attacking micrometastases.

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Members in the Media

"All I can say is we're kept very securely...away from central DC and we have excellent communications should they be required. And that's really as far as we can go. Other than that we had a steak dinner as we watched the State of the Union speech."

***Ernest Moniz**, Department of Energy, on being the administration's "designated successor" for the 2014 State of the Union–the person who becomes acting president in the event of catastrophe,* Time Magazine*, April 22, 2014.*

"We didn't explain the Higgs in any real thorough way. But people came out of the movie and said, 'My God, that was the best explanation I've ever heard!' If you go back, no it wasn't. We tricked people into thinking they understood a lot more than they did because they digested it in an emotional context."

***David Kaplan**, Johns Hopkins University, on his film "Particle Fever" about the hunt for the Higgs Boson,"* The Los Angeles Times*, April 25, 2014.*

"The whiteboards the characters use for equations have actually changed into something where real scientists pitch me their latest results and ask if they can appear on them. It's sort of become a thing to get on the whiteboards."

***David Saltzberg**, University of California, Los Angeles, on working for the TV show "The Big Bang Theory,"* The Washington Post*, May 5, 2014.*

"When the ability to convert biology to data and data into biology becomes that cheap, that agile, that easy to do, what are the consequences?"

***Neil Gershenfeld**, MIT, on the potential dangers of synthetic biology,* The New York Times*, May 9, 2014.*

"I would guess there's about a 60 percent chance that I'm not going to die of old age, but from some kind of human-caused calamity. Which would suggest that I should spend a significant portion of my time actually worrying about this. We should in society, too."

***Max Tegmark**, Massachusetts Institute of Technology, on why he thinks artificial intelligence is one of the greatest existential threats to human kind,* TheAtlantic.com*, May 9, 2014.*

"There are several issues that arise, ranging from climate change to artificial intelligence to biological warfare to asteroids that might collide with the earth…. They are very serious risks that don't get much attention. Something like climate change is of course a very serious problem. I think the general feeling is that already gets a lot of attention. Where we could add more value is in thinking about the potentials of artificial intelligence."

***Frank Wilczek**, Massachusetts Institute of Technology, on why he and other scientists founded the "The Future of Life Institute,"* TheAtlantic.com*, May 9, 2014.*

"This is a really important article–the impression I get is that it's almost unethical to be lecturing if you have this data."

***Eric Mazur**, Harvard University, responding to a study that found college lectures are less effective than other means of teaching,* PBS NewsHour*, May 12, 2014.*

"I don't care if Oprah is a neighbor, but if she is going to cut off access to trails, I don't find that acceptable."

***Charles D. Goodman**, Tulane, on suing the media magnate over blocking access to public hiking trails,* The Denver Post*, May 15, 2104.*

"They have very nice measurements of something. We don't know what that something is…. We can't tell if BICEP2 has measured dust or has measured gravity waves."

***Uros Seljak**, University of California, Berkeley, raising concerns about the March announcement of evidence of cosmic inflation,* The Washington Post*, May 16, 2014.*

This Month in Physics History

June 1963 and 1983: First Soviet and American Women in Space

When Russia launched the first man into space in 1961, it heralded the start of a new era in exploration. And it wasn't just men lining up for the chance to emulate Yuri Gagarin's historic voyage. Rocket engineer Sergei Korolev, who headed the cosmonaut program, decided the next logical step would be to send a woman to space. He personally selected several promising candidates for the fledgling female cosmonaut program, including Valentina Tereshkova.

Tereshkova was born in a central Russian village called Maslennikovo to recent immigrants from Belarus. Her father drove tractors for a living; her mother was a textile worker. Much of Tereshkova's education was completed via correspondence courses, and by age 22 she was working in a textile factory like her mother. Tereshkova was also interested in skydiving and made her first parachute jump in 1959–and that is what caught the attention of the Soviet space program a few years later.

Photo from Wikimedia Commons

Sally Ride (top) and Mae Jemison

Tereshkova beat out 400 other applicants to become one of five finalists. In addition to meeting the stringent physical requirements, her personal story was compelling. She hailed from working class roots, and her father had died fighting for Russia in World War II, when she was just two years old. Tereshkova survived the grueling training program, and was selected for the space mission Vostok 6.

On the morning of June 16, 1963, Tereshkova officially became the first woman in space, logging an impressive three days in orbit, despite suffering from nausea. It was the last launch in Russia's Vostok program; the female cosmonaut group was disbanded in 1969, and another 13 years would pass before cosmonaut Svetlana Savitskaya became the second woman in space in 1982. In the interim, Tereshkova became a leading figure in the Russian Communist party, and her reputation as a national heroine persisted even after the collapse of the Soviet Union.

Tereshkova inspired other women to dream about traveling into space–among them a young physicist named Sally Ride. Ride hailed from Los Angeles, where her father was a political science professor at Santa Monica College, and her mother worked at a women's correctional facility. Ride loved all things science, and was also a star tennis player in high school. But science won out in the end: She earned a PhD in physics from Stanford University, studying the interaction of x-rays with the interstellar medium.

In 1978, she joined 8,000 other aspiring applicants for NASA's space program, and won admission. She served as the ground-based commander for the second and third flights of the space shuttle program, and eventually won a spot on the seventh mission, aboard Challenger. The fact that she was a woman drew considerable media attention and more than a few impertinent questions. Reporters saw nothing amiss with asking about the possible impact of microgravity on her child-bearing fitness, or whether she sometimes cried on the job. But Ride saw herself only as an astronaut, who just happened to be a woman, and shrugged it off.

On June 18, 1983, she became the first American woman in space (and third overall), and on that mission she successfully used a robot arm to retrieve an errant satellite. A year later, she was back in space aboard Challenger for her second and final mission. When the shuttle exploded mid-flight in 1986, Ride was chosen to serve on the presidentially appointed Rogers Commission investigating the accident.

Ride left NASA in 1987, and joined the faculty of the University of California, San Diego, in 1989. But she continued to work with NASA on public outreach, and served on the 2003 commission to investigate the crash of the Columbia space shuttle. She also authored several children's books with Tam O'Shaughnessy, a psychology professor at San Diego State University, who later was revealed to have been Ride's partner after Ride passed away in 2012 from pancreatic cancer. (Ride had previously been married to a fellow astronaut, Steve Hawley; they divorced in 1987.)

Like Tereshkova before her, Ride inspired young women to follow her into space–most notably Mae Jemison, who became the first African-American woman in space when Endeavour launched on September 12, 1992. Growing up in Chicago, Jemison thought traveling to space would be commonplace by the time she grew up. She admired the actress Nichelle Nichols, best known for her portrayal of Lieutenant Uhuru on Star Trek. Jemison loved science, as well as dance and the arts, and entered Stanford at age 16, eventually earning a medical degree from Cornell Medical College. She then spent several years with the Peace Corps, serving in Liberia and Sierra Leone.

After Ride's history-making flight in 1983, Jemison decided to apply for NASA's astronaut training program. She admitted she thought it would easier than "waiting around in a cornfield waiting for ET to pick me up...." She wasn't accepted, but she applied again in 1987 and this time she got in. It was never about being the first African-American woman in space, Jemison always insisted: "I wouldn't have cared less if 2000 people had gone up before me…. I would still have had my hand up, 'I want to do this.'"

Jemison flew only one space mission, aboard

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Diversity Corner

APS Announces 2015 CUWiP Sites

The 2015 APS Conferences for Undergraduate Women in Physics (CUWiP) will be held Friday, January 16 through Sunday afternoon, January 18, 2015 at:

- North Carolina Research Triangle
- Purdue University
- Rutgers, The State University of New Jersey
- University of California, Santa Cruz
- University of Michigan
- University of Mississippi
- University of Texas at Brownsville
- Yale University

The APS CUWiP goal is to help undergraduate women continue in physics by providing them with the experience of a professional conference, information about graduate school and professions in physics, and access to other women in physics of all ages with whom they can share experiences, advice, and ideas. Learn more at: http://www.aps.org/programs/women/workshops/cuwip.cfm

APS Bridge Program Summer Meeting – Registration deadline June 6, 2014

The 2014 APS Bridge Program Summer Meeting (www.apsbridgeprogram.org/conferences/summer14/) will be June 25-27, in College Park, MD, at the American Center for Physics. The meeting is designed for faculty, students, and administrators interested in increasing the number of underrepresented minorities (URMs) pursuing PhDs in physics. Registration is now open, and ends June 6, 2014 at 5 p.m. EDT. Consider becoming a Member Institution (apsbridgeprogram.org/institutions/member) to qualify for discounted registration rates.

The theme of the meeting is the role of the Master's degree in advancing URMs in physics.

The Meeting features workshops, panel discussions, and presentations on:

- connecting MS/PhD institutions
- role of Masters' degrees for URM students
- barriers to student advancement to the PhD
- mentoring
- beyond the GRE: Alternative admissions measures.

APS has secured a block of rooms at the reduced rate of $149 per night. Reservations should be made by June 6th, 2014 in order to secure the reduced room rate.

For more information, visit the conference website www.apsbridgeprogram.org/conferences/summer14/ or email questions to bridgeprogram@aps.org.

Sign up to receive the COM/CSWP Gazette

The COM/CSWP *Gazette* features updates on CSWP and COM activities and programs, book reviews, statistical reports, and articles on programs designed to increase the participation of women and minorities in science. To add your name to the *Gazette* mailing list, e-mail women@aps.org and include your postal mailing address. Read the spring 2014 issue now at http://www.aps.org/programs/women/reports/gazette/upload/spring14.pdf

Accepting Nominations for the CSWP Woman Physicist of the Month

The APS Committee on the Status of Women in Physics (CSWP) Woman Physicist of the Month award recognizes female physicists who have positively impacted other individuals' lives and careers. Each CSWP Woman Physicist of the Month is featured on the Women in Physics website (www.WomenInPhysics.org), announced in the *Gazette*, and recognized at a reception at an APS national meeting.

Nomination is easy: email a three-paragraph statement explaining why the physicist you are nominating is worthy to women@aps.org.

Follow APS Diversity on Twitter

Curious to hear the latest happenings in physics and diversity? Follow @APSDiversity on Twitter.

Download the Women in Physics InSight Slide Show

Physics InSight is a series of slide shows designed to inform and excite undergraduates about physics. Download a slide show focused on women in physics at: http://www.aps.org/careers/insight/

Nominate a Woman or Minority for APS Fellowship, Prizes and Awards

The APS Fellowship Program was created to recognize members for outstanding physics research, important applications of physics, leadership in or service to physics, or significant contributions to physics education.

Further information on the fellowship nomination process can be found online at http://www.aps.org/programs/honors/fellowships/

For information on nominating women and minorities for APS prizes and awards, please visit http://www.aps.org/programs/honors/nomination.cfm

Leadership Changes at Top US Science Organizations

By Michael Lucibella

New leaders were named at three top US science institutions in late March. Argonne National Laboratory, Lawrence Livermore National Laboratory and the National Science Foundation all named physicists as their new directors.

Peter Littlewood, a physicist at the University of Chicago and the director for physical sciences and engineering at Argonne was named director on March 25. He will succeed Eric D. Isaacs, who is leaving to become the provost at the University of Chicago. Littlewood is an APS Fellow and a member of the editorial board for the APS journal *Physical Review B*.

"I am proud to follow in the footsteps of so many great scientists and leaders in this powerful laboratory," Littlewood said in a statement. "Engaging the grand challenges of energy and sustainability, Argonne is well positioned with our great legacy, strong programs, and above all, our talented and committed staff."

Before coming to Argonne, Littlewood served as the head of the Cavendish Laboratory and the physics department at the University of Cambridge in the UK Prior to that, he spent much of his career at Bell Labs, where he became head of theoretical physics research.

Two days later and two thousand miles away, Bill Goldstein was named the new director of Lawrence Livermore National Laboratory (LLNL). He'd been at the lab for 29 years, most recently holding the position of deputy director of science and technology. He was instrumental in the creation of the lab's Jupiter Laser Facility and helped open the National Ignition Facility to outside users.

Argonne National Laboratory
Peter Littlewood

Lawrence Livermore National Laboratory
Bill Goldstein

National Science Foundation
France Córdova

"I am honored to be entrusted with this responsibility," Goldstein said in a statement. "I look forward to working with my LLNL colleagues, DOE [Department of Energy], NNSA [the National Nuclear Security Agency] and LLNS [Lawrence Livermore National Security, LLC] to ensure that this extraordinary institution continues to enhance the nation's security and well-being through outstanding science and technology."

Goldstein takes over from Bret Knapp, who had been the interim director since October when Parney Albright resigned.

At the National Science Foundation (NSF), France Córdova, an astrophysicist and president emerita of Purdue University, was sworn in as director on March 31. She will serve a six-year term as head of the NSF, taking over from Cora Marrett who has been serving as acting director since January of 2009.

"I am deeply honored to lead this prestigious organization," Córdova said in a statement. "I look forward to working with the Administration, Congress, the scientific community and NSF staff in advancing scientific discovery, technological innovation, and STEM education. I am especially eager to engage with the public on science and its importance to our nation's prosperity and global leadership."

Córdova has had a distinguished career in both academia and the public sector. She was president of Purdue from 2007 through 2012, after leading the University of California at Riverside as chancellor from 2002 through 2007, and vice chancellor of the University of California at Santa Barbara from 1996 through 2002. Previously she was NASA's chief scientist, a professor at Pennsylvania State University, and a researcher at Los Alamos.

APS Bridge Program Selects New Sites

By Bushraa Khatib

The APS Bridge Program (APS-BP) recently announced that California State University, Long Beach (CSULB) and Florida State University (FSU) will receive funding to develop bridge programs designed to increase the number of underrepresented minority (URM) students receiving a PhD in physics. The APS Bridge Program seeks to increase the number of physics PhDs awarded to URM students by creating a network of mentoring programs to help them complete their PhDs.

This is the APS Bridge Program's second round of site selection since the program launched in 2012. Newly selected sites join The Ohio State University (OSU) and the University of South Florida (USF), the first two funded sites, whose bridge programs are already underway. URM students, including African Americans, Hispanic Americans and Native Americans, currently receive only about five to six percent of all physics PhDs given to US citizens, a number the program is working to increase.

Students selected as APS Bridge Fellows receive stipends to participate in programs at the bridge sites. APS-BP will fund two students at each of its four sites, with the possibility of placing more if bridge sites are able to secure their own funding, as OSU and USF did last year.

CSULB is the largest master's-granting physics department in the US and has an established track record for transitioning students into doctoral programs. Of the graduating master's cohort in 2014, five URM students were accepted into doctoral programs. Through the Bridge Program, CSULB will admit two students as Bridge Fellows into its master's program, where they will receive mentoring, take courses, engage in research, and receive application coaching in order to apply to doctoral programs. Andreas Bill, site leader at CSULB, said, "To become an APS Bridge Site is a great opportunity to reach out to underrepresented minorities in physics in the diverse urban environment."

FSU will enroll at least two URM students a year into the Bridge Program, and will ultimately bridge them to a PhD program at FSU or elsewhere. Bridge Fellows will begin the program as research interns at the National High Magnetic Field Laboratory (MagLab) in Tallahassee in the summer prior to enrollment. In the first academic year, Bridge Fellows will take advanced undergraduate courses before enrolling in core graduate courses. After a second summer of research, students will enroll in a mix of core graduate courses and MS thesis credit, and will qualify for a thesis-based MS degree by the end of their second year. Bridge Fellows receive full stipend and tuition support, and will not have to teach until their second year in the program.

"The goal of our Bridge Program is to give the best opportunity to succeed in graduate school in physics to minority students who would otherwise have slipped through the cracks," said Simon Capstick, site leader at FSU. "We have recently been able to increase the involvement of women and minorities in our physics graduate program, and the APS Bridge Program will significantly enhance this." Capstick said support from the FSU administration and the physics department for the Bridge Program, and also for other efforts

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Letters

Members may submit letters to letters@aps.org. APS reserves the right to select letters and edit for length and clarity.

Attitudes toward industrial postdocs

Alvin Saperstein's letter about industrial postdoc positions (*APS News*, March 2014) brought back some not-so-fond memories. During the early 1970s I served as the director of the Physics and Chemistry Division of the North American Rockwell Science Center. Several group leaders and I were trying to set up an industrial postdoc program. We discussed our proposal with professors at several leading institutions. The receptions we received were often hostile. At a meeting with faculty in the Physics Department at Berkeley we were accused of "only looking for cheap labor to advance our scientific projects." Others made it clear that they would participate only if we intended to give them grants or consulting contracts.

Attitudes have changed a lot since [the] 1970s and perhaps an APS-endorsed program might now succeed. I certainly hope so.

Thomas Wolfram
San Clemente, California

Advantages of the Master of Arts in Teaching degree

We were thoroughly heartened by the article "The Role of Physics Departments in High School Teacher Education" (Back Page, *APS News*, August/September 2013), and we encourage all departments willing and eager to boost their fields of study to consider petitioning their institution to establish a Master of Arts in Teaching degree.

Virtually all the points delineated in the article would be encompassed by an MAT degree, which is awarded by the department in question rather than by the School of Education. This ensures a thorough, rigorous, and precise instruction of the subject matter, which can be tailored to target content typical of a high school classroom.

The advantage of an MAT program over either an MA or an MT is that it requires a serious investment on the part of both the specific department and the School of Education. The department takes charge of preparing its students to possess a comprehensive content-knowledge background, while the School of Education administers a variety of pedagogy, psychology, and even law courses, which provide teachers-in-training with the latest techniques and best practices in secondary education. The direct alliance with the School of Education also facilitates the student teaching and certification processes thus freeing the departments to focus their time and resources elsewhere.

One of us (P.R.-B.) is a graduate of an MAT program in classical studies, and could not be more pleased with the intensive but broad preparation she received to begin a career as a high school Latin teacher. We desire that the same opportunity be made available to all aspiring teachers in any and all fields.

Paula Rondon-Burgos and Oscar Rondon
Charlottesville, Virginia

Leveling the playing field for non-tenure track researchers

Including and supporting "industrial" physicists with local chapters as recommended by the APS Early Career Task Force (Brad Conrad, Back Page, *APS News*, December 2013) is a good idea. However, I wonder if everyone recognizes that the goal of improving corporate competitiveness is at least partially responsible for the limited participation of these physicists in what I agree with Conrad is an APS heavily biased toward "academic physics." The proprietary nature of industrial research may prevent presentation of results at local chapter meetings.

What might serve this group of physicists as well would be presentations at local chapter meetings that would allow these physicists to hear the latest in more academically oriented physics research that they don't have an opportunity to hear where they work. The local chapter meetings would function in the same way that physics department colloquia function, and this might help foster the sense of a single physics professional community for this group of underserved physicists.

My biggest concern with the report, however, is that it overlooks a significant part of the academic physics research community by considering only tenure-track and tenured professors, and their "temporary" undergraduate, graduate, and postdoctoral students. This attitude is clear in the article and ignores the cohort of full-time, career (not temporary) academic researchers: in the University of California System, for example, they have payroll titles of research associate, project scientist, and research scientist, although professional titles vary by academic institutions.

My own experience suggests that significant numbers of early career scientists are also dramatically under-served by APS programs (even established non-tenured, career academic researchers like myself are under-served), and by agencies like NSF which provide extramural support. Even the DOE Office of Science, which supports significant numbers of such researchers, bans them from applying for Early Career Awards which are (in my view, unfairly and unwisely) restricted to national laboratory staff and tenure-track professors.

This bias against permanent non-tenure-track academic researchers pervades professional organizations like APS, the universities where they work (which like APS are largely governed by tenured professors), and even the organizations which provide extramural support for research. I think that a concerted effort to acknowledge the concerns and problems faced by this cohort in our profession is long overdue at APS headquarters. If we are indeed a single research community, then we must level the playing field for these early career physicists.

Rick Moyer
San Diego, California

Golden Goose Award for Unorthodox Research

By Michael Lucibella

Earlier this year, an unusual honor underscored the direct link between basic research into black holes and the explosion of the Internet. APS Fellow Larry Smarr of the University of California, San Diego, received a 2014 Golden Goose Award for proposing and directing the country's first academic supercomputer center.

A group of science organizations and members of Congress established the Golden Goose award in 2012 to recognize the contributions of unorthodox-sounding federal research that made a significant social or economic impact. APS is one of the award's sponsors.

The Golden Geese are a counterpoint to the Golden Fleece Awards created in the 1970s by the late congressman William Proxmire (D-WI) to mock government waste, especially research that he deemed silly. Instead, the Golden Goose Award is designed to highlight the need for funding research that may not sound immediately practical, but has unexpected benefits.

While studying the physics of black holes at the University of Illinois at Urbana Champaign, Smarr won an NSF grant to establish the National Center for Supercomputing Applications. Two researchers at the

California Institute for Telecommunications and Information Technology
Larry Smarr

center, Marc Andreessen and Eric Bina, created Mosaic, the first widely used graphic web browser, which helped power much of the early 1990s Internet boom. "It's a story that needs to be told more because people just assume corporations invented the web," Smarr said.

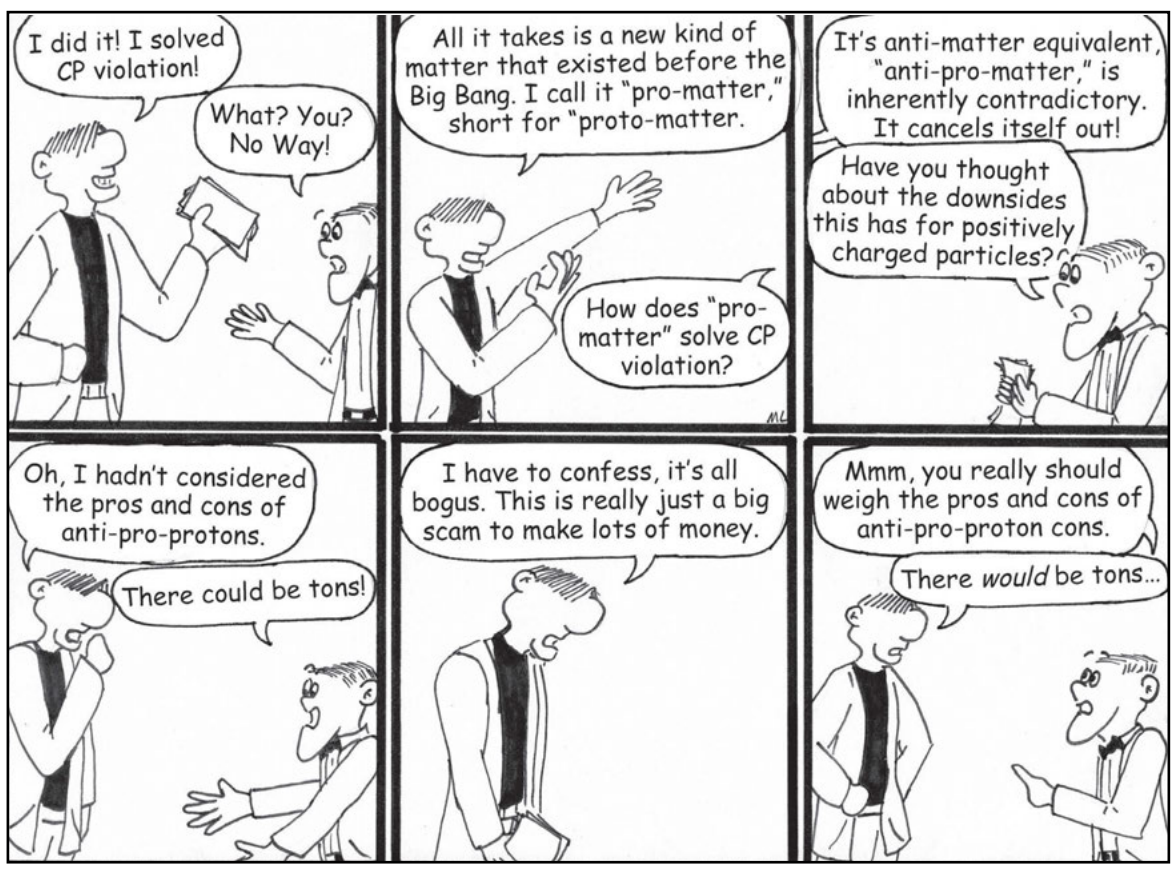
Representatives Randy Hultgren (R-IL) and Jim Cooper (D-TN) announced the winner of the award at the January 2014 meeting of the American Association for the Advancement of Science in Chicago.

"Science that is 'strange' to Congress can lead to the next scientific breakthrough, and these scientific inquiries are vital for America to maintain its place as an innovative and exceptional nation," said Hultgren.

Zero Gravity

the lighter side of science

By Michael Lucibella



Finding New Physics Among Earthquake Lights

By Calla Cofield

When tectonic plates shift–grinding against each other and creating earthquakes–they are usually lubricated by a layer of pulverized rock. In her lab at North Carolina State University, Karen Daniels studies small plastic disks that slide against each other, similar to Earth's tectonic plates. Daniels and her colleagues are investigating whether or not the plastic disks, and possibly the grains in between the plates, produce acoustic signals as they move.

Now her work has taken a new twist. Last year, Troy Shinbrot, a physicist at Rutgers, approached Daniels and asked her if she wouldn't mind measuring the voltage near the plastic disks during her experiments.

Of course, two different materials rubbing up against each other can generate a charge via frictional forces, also known as the triboelectric effect; an example of this is the static electricity that builds up in a wool sweater as it rubs against a cotton t-shirt.

But Daniels is looking at grains of the same material, and there is no clear reason why a voltage would build up when the plastic disks rub against each other.

"If you'd asked me [a year ago] if my experiment was producing voltages, I would have said 'no, probably not,'" said Daniels.

When she measured the voltage as the disks slide against each other, she found a positive voltage that increased with the distance the disks moved.

The experiment is not an anomaly. Before contacting Daniels, Shinbrot experimented with tubs of flour, acetaminophen powder, plaster, and other granular materials that have some cohesiveness. A horizontal jerk of the container opens a trench in the material, and this creates a negative voltage. Another jerk closes the trench, creating a positive voltage.

"Our first suspicion was, this has got to be a mistake. There's something stupid we're doing; the container is charging, there's some other thing we're not taking account of," said Shinbrot at a press conference at the APS March Meeting in Denver. "So we've tried many, many tests to remove these spurious effects, and so far we have failed." The team measured a maximum of 400 volts, but found that the currents in the materials were near zero.

Heinrich Jaeger at the University of Chicago studies charged grains falling through a vacuum–a line of inquiry that could help explain why airborne granular materials can sometimes become explosive. Jaeger has been paying attention to work done by Shinbrot as well as research by Daniel Lacks at Case Western University, on the subject of same-grain charging. While there is a significant body of literature on falling grains and the triboelectric effect, he says very little is known about the same-grain charging that Shinbrot is exploring.

"Even if we ignore the underlying mechanism for a moment, there is still controversy about the most basic issue, such as what kind of charge carriers are producing the charging," said Jaeger in an email. "There are reports that these carriers might be electrons or holes or ions or even bits of charged material, and probably this will depend on the detailed circumstances."

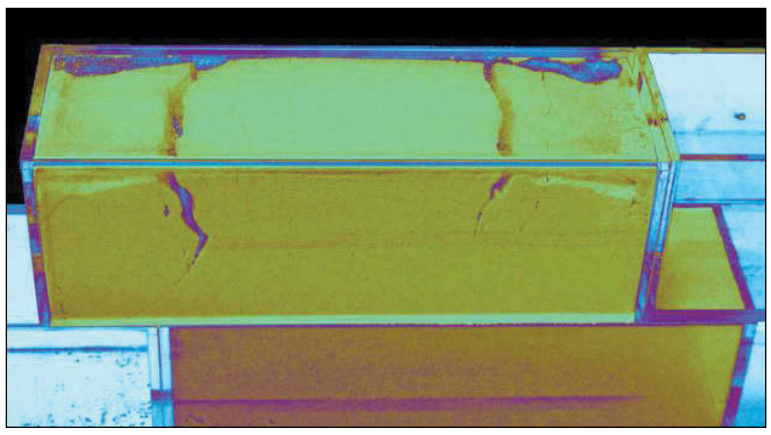
Shinbrot began his investigation as a way to potentially explain the puzzling phenomenon often called "earthquake lights." Appearing in forms that vary from floating orbs of fire to lightening-like bolts, these have been observed before, during, and (in a few rare cases) after earthquakes. They have also been observed near avalanches, as well as independent of either event. Humans have studied the possible connection between lightning and earthquakes for at least 300 years, and Shinbrot warned at the Denver meeting that an Internet search for information on this subject will also yield a high number of speculative theories about UFO's.

But Shinbrot is not the only one trying to separate the speculation from the science.

A research collaboration led by scientists from Quebec's Ministry of Natural Resources compared basic information about 65 observed instances of earthquake lights, and published the results in the January/February 2014 issue of *Seismological Research Letters*. The authors implicated stress-induced currents as the cause of the earthquake lights, but Shinbrot says the experimental results he's seen indicate that the charging "seems to be associated with individual grains and not bulk properties." That would rule out piezoelectricity, which arises in a material due to mechanical stress.

To connect earthquake lights with grain charging will obviously require an understanding of how the charging phenomenon scales up. Shinbrot says he and his colleagues are "building larger versions of some of these devices to try to answer that question."

"We're really just wandering around in the dark observing these things," said Shinbrot during his session talk in Denver. "We want to know what's going on. We really don't know."



Troy Shinbrot/Rutgers

Experiments showing that granular motion causes generation of electricity may explain so-called "earthquake lights."

INSIDE THE Beltway

Does Science Have Any Washington Guarantors Anymore?

by Michael S. Lubell, APS Director of Public Affairs

"If you want a friend in Washington, get a dog," so said Harry S. Truman more than half a century ago. Actually he never did, according to his presidential library, but he might just as well have. And he might just as well have been speaking to America's scientists today. Here's why.

In just a few months, science will lose three friends–of the human variety–when Sen. Jay Rockefeller (D-WV), Rep. Frank Wolf (R-VA) and Rep. Rush Holt (D-NJ) retire at the end of the year. Replacing them will not be easy.

Rockefeller, along with former Sen. Bill Frist (R-TN), was a principal cosponsor of the original "doubling bill," S. 296, "The Federal Research Investment Act" of 1999, which proposed doubling the budgets for non-defense R&D over twelve years.

Wolf, from his perch atop the Commerce-Justice-Science appropriations subcommittee, has been one of the guarantors of funding for the National Science Foundation, the National Institute of Standards and Technology and the National Aeronautics and Space Administration. He was also an initiator of the National Academies report, "Rising Above the Gathering Storm" that led to the America COMPETES Act and President George W. Bush's America Competitive Initiative.

And for many years physicist Rush Holt teamed with his former colleague Rep. Vern Ehlers (R-MI), also a physicist, as the conscience of science in the House.

In Washington circles, it's assumed scientists are and always have been knee-jerk Democrats. And in scientific circles, it's assumed Democratic officeholders are and always have been knee-jerk supporters of science. Neither is true

I cut my political teeth in the Republican Party at the same time I was climbing the physics ladder at Yale. And science in that era, if it found any partisan preference, was probably more of a Republican brand than Democrat. You need look no further than D. Alan Bromley, who was the chairman of the Yale Physics Department, later to become George H.W. Bush's science advisor.

More recently, you couldn't find more staunch supporters of science than Rep. Sherwood "Sherry" Boehlert (R-NY) and Sen. Pete V. Domenici (R-NM). But in the last half dozen years Washington has changed, and the Tea Party brand of Republicanism–with some rare exceptions–has caused an anti-science flavor to gel into the GOP aspic.

At the same time, as I have been warning my Washington colleagues for quite a while, Democratic populists are far from the knee-jerk science supporters many Inside-the-Beltway science advocates think they are. Case in point: A few weeks ago, I was at a private dinner on Capitol Hill, hosted by one of my close friends, who also happens to be a member of the House of Representatives. With few exceptions, the other partakers of food, drink and conversation were also members of Congress–by way of disclosure, all of them Democrats. Since the affair was private, I cannot reveal the names of the protagonists. Suffice to say they were quite highly placed and highly visible.

Earlier that day, the House had been expected to take up legislation making the Research and Experimentation Tax Credit permanent–something that has been on the high-tech lobbying agenda for many years. The perennial stumbling block for permanency had been an arcane budget rule that allowed Congress to enact a last-minute yearly tempo-

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Profiles In Versatility

Still Life with Physicists: Sculpting Science into an Art Conservation Career

By Alaina G. Levine

A painter's canvas, like a career, can have many layers. And as one examines those strata, one begins to get a glimpse into the secret history of that painting. At museums and academic institutions around the world, physicists and other scientists utilize their technical expertise to not only uncover those secrets, but also preserve and conserve humanity's most precious works of art.

At the Metropolitan Museum of Art's Department of Scientific Research, physicists, chemists, materials scientists and other professionals work hand-in-hand with art conservators and historians to better understand the millions of items the institution houses, and to ensure they can be appreciated by generations to come. Projects range from analyzing individual artistic elements, such as pigments, clay or canvas, to elucidate the historical significance of a work, to designing and building display cases and lighting that won't negatively impact the art.

The Met's lab, which is one of the biggest in the US, is headed by Marco Leona, a PhD chemist with expertise in crystallography. While pursuing a postdoc at the University of Michigan, "I realized I was not interested in a career in chemistry in a traditional way, and at the same time I was discovering American art museums," the native Italian says. Visiting the Detroit Museum of Art, as well as others, opened his eyes to the possibility of contributing to the art world from the scientific side. He started cold-calling scientific labs in museums and gathering information about career paths, and pretty soon the Los Angeles County Museum of Art (LACMA) invited him to apply for a position in its research department.

Leona helped improve and consolidate LACMA's science department and today it is "one of the best labs in the country," he says. In 2004, he headed east to the Met. The variety of assignments is very appealing. "One day, I'm working on a painting, the next, it's a bronze statue, perhaps Egyptian or Etruscan," he says. "The diversity and breadth of the casework is such that we have to adapt and innovate."

One of his projects involved an analysis of Japanese paintings from 1700 to 1860. He carefully looked at the pigments employed throughout that time and noticed marked differences as Japan be-

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Photo by Pete Brown/ University of Arizona

Robert Erdmann uses the tools of materials science and mathematics to reveal the secrets of paintings.

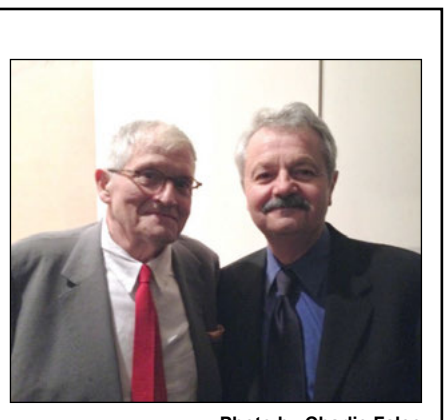

Photo by Charlie Falco

Artist David Hockney (left) and physicist Charlie Falco (right) collaborated on an investigation of optical methods used by renaissance painters.

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energy output from the process than input.

"Ignition is only part of what NIF was built for and what it is actually doing," said Jon Eggert, a researcher at Livermore. "There's actually a fairly large contingent of people that want to do fundamental science on NIF."

While its dual primary missions take up about 90 percent of the facility's laser blasts, or "shots," the thin slot for other fundamental science is enlarging. New scheduling policies will give independent researchers more time and shots on the machine.

"The real issue has been that for many years there were virtually no shots allocated to the fundamental science program," Lamb said. "This went along with an incredible single-minded focus pursuing ignition through a single path."

Before the facility was completed, the DOE put out a call for proposals to do fundamental science at the facility. A number of researchers responded, and the NIF offices assigned nine teams their own shots at the laser facility.

Parceling out a set number of shots, however, rather than blocks of time as at other user facilities, brought about backups and delays at the lab. Experiments that weren't ready by their scheduled shot day would keep tying up the machine until they were ready, delaying other experiments. This slipping schedule made it difficult for scientists and graduate students to plan their trips to Livermore in advance.

In addition, there weren't many fundamental science shots to start with. In 2009 there were two shots allotted to fundamental science. The next year there was one. The numbers slowly started to increase. There were four fundamental science shots in both 2011 and 2012 and seven in 2013. This year is slated to have eight shots. Researchers originally hoped for more, but budget cuts from the US government's funding sequestration cut the total number of shots for all experiments.

"We just haven't had enough shots to [accommodate] all of those teams," said Chris Keane, the director of the NIF user office at Livermore. "We are looking at issuing a new call soon."

For the new lineup of experiments, the NIF leadership is revamping the scheduling system. Research teams will be able to apply for a set number of days at the NIF and can shoot the lasers as much or as little as they need to during that time.

"Because it's shot days, if you're not ready, they won't wait for you," Lamb said.

"That's going to help not only the NIF be efficient.... It's also going to help, I think, the academic experimental groups."

The lab is also working to increase the total number of shots for all types of science. In 2013 there were a total of 209 laser shots. Because of sequestration, the number for 2014 is down to about 150, but lab administrators are hoping to have between 250 and 300 shots in 2015, and about 300 in 2016. Right now administrators are scheduling experiments for the spring of 2015.

The changes came about in part from a recent study mandated by the Senate Appropriations Committee to find ways to increase the number of shots and overall science output at the machine.

In addition, recent leadership changes at Livermore put people in positions to build up the fundamental science at the NIF. The lab's new director, William Goldstein, has been widely credited for advocating for fundamental science at NIF since its inception. Similarly, Jeff Atherton was named head of NIF in May of 2013 and is also seen as a strong proponent of basic research.

"Jeff is very transparent and open about issues we have to overcome," Lamb said. "He's doing everything he can to increase the science being done at the NIF."

There are other laser facilities across the country that can do similar experiments at lower energy. The Jupiter Laser Facility at Livermore and the Omega Laser at the University of Rochester are essentially older, smaller versions of the NIF that do laser compression science.

"[NIF] is just a totally new regime," Keane said. "It's the energy, but it's also the precision and the reproducibility."

Experiments at NIF have probed the phases of hydrogen at high densities, how stars form in the Eagle Nebula, and how hydrodynamic instabilities affect supernovas. There have also been about 60 "ride-along" shots that take data during a dedicated fusion energy or stockpile stewardship shot (mostly nuclear cross-section experiments).

Jon Eggert uses the lasers at the NIF to explore the properties of matter at the center of gas giant planets. Astronomers have discovered hundreds of confirmed exoplanets, but no one knows what molecular and material structures are at the core of the largest planets.

"If we want to answer those sorts of questions, we actually have to know what's happening on the inside of those planets," Eggert said. "To do that we need to have experiments."

SECTOR continued from page 1

the search.

"We have to be much more open-minded," Lang said in an interview. "We haven't found the easiest solution, so we have to look for the next best thing."

The size of this theorized dark sector could potentially be huge. Physicists have proposed models that include multiple new particles and forces.

"Around 2008, people started thinking about models where the dark matter sector was much more complicated," said Kathryn Zurek from the University of Michigan. "The idea was that there was this hidden world that was separated from us."

In part, this arose from anomalous signals in 2008 from the orbiting Payload for Antimatter Matter Exploration and Light-nuclei Astrophysics (PAMELA) experiment, which picked up a large unexpected excess of positrons. Though not definitive, this excess fits with some models of self-annihilating dark matter that required another carrier particle. At around the same time, other unexpected signals in the unrelated DAMA experiment in Italy also piqued the interest of physicists.

"All these anomalies that were building up sort of focused people's attention," Zurek said.

Over the next several years, experiments looking for heavy Weakly Interacting Massive Particles (WIMPs), long thought to be the top candidate for dark matter, kept turning up nothing.

"As direct detection and Large Hadron Collider (LHC) experiments have ruled out our favorite ideas over the last decades, people are thinking of other things," Hooper said. He added also that there was a new generation of physicists coming to prominence that was more willing to explore new ideas. "It doesn't only reflect the changes in the experimental physics data, but it also reflects the new blood."

Another possibility is that depending on how these theorized particles behave, different detector materials might be less sensitive to certain kinds of WIMPs. It's a theory that could explain the apparent signals in DAMA and the Coherent Germanium Neutrino Technology (COGENT) experiment, and the lack of a signal in other similar experiments.

"CDMS's germanium detector [data] are very much in conflict with those of COGENT," Cabrera said. "We really need to increase our search to include multiple target materials."

The search continues in parallel for evidence of another theorized particle, the axion. Originally predicted by nuclear physicists to solve a problem in quantum chromodynamics, axions have a tiny fraction of the mass of an electron, making them nearly impossible to detect. Over the next three years, the University of Washington's Axion Dark Matter eXperiment will listen for the weak signals of axions converting into microwaves. However, if at the end of the run their experiment turns up nothing, the collaboration would be facing an impasse.

"There's a natural stopping point on the experimental side," Cabrera said. The detectors are becoming so sensitive that if axions are light enough, the neutrino barrage from the sun could drown them out. "The next generation [of detectors] will in fact see solar neutrinos as a signal."

Even if the search discovers axions, it might not close the book on the dark matter mystery. "We would really like something like the axion to exist, but it doesn't have to be all of the dark matter," Cabrera said.

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that improve diversity, is essential for continued progress. Moreover, he added, "[We expect that] what we learn from working to maximize the chance of success of our Bridge Program students will help us with the retention and success of all of our students."

Bridge Program Manager Brian Beckford is excited that the addition of new sites translates into more research topics available to students, including opportunities at the MagLab, and the ability to reach students on the west coast through CSULB. "Placing more students and the continuing success of the program could dramatically change the face of physics graduate departments and society in general," he said.

In addition to placing students at APS Bridge Sites, the program also sends student applications to other graduate programs that may have slots available, depending on research interests. Through this process, the APS Bridge Program hopes to make a significant impact. In 2013, 15 students who would not otherwise have begun graduate education were admitted to either bridge programs or directly into graduate programs. The project is on track to increase that number in 2014.

The program will host its annual APS Bridge Program meeting at the end of June. This year's meeting focuses on the role the master's degree plays in advancing URM students in physics. The program anticipates issuing another request for proposals for new Bridge Sites in fall 2014.

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The drugs can be engineered to bind to receptors that are found on the cancer cells. When released nearby, beta particles do significant damage to cell DNA by ionizing other atoms and creating reactive chemical species in the cells.

Alpha particles are more direct, delivering energy directly to the cell DNA and fatally disrupting chemical reactions. And while beta particles deliver a few hundred keV of energy over a few millimeters, alpha particles deliver a bigger punch of 5 MeV, but stop after a distance of a few microns. "That very large amount of energy deposited in short range…makes them more cytotoxic to the cell than beta emitters," said Robertson. "And it will allow you to get the same therapeutic effect with [about an order of magnitude] less radioactivity."

In May, the FDA approved Xofigo, previously known as Alpharadin, which contains the alpha emitter radium 223 chloride. Xofigo is currently being used to treat bone metastasis associated with prostate cancer. Robertson reports that a clinical trial of Alpharadin was so successful compared to placebo that the trial was stopped, so the control group could receive the drug as well.

Robertson and his collaborators from Oak Ridge National Laboratory and the University of Tennessee are in the preclinical phase of research to adapt the alpha emitter actinium 225 for endoradiotherapy. The isotope has a half-life of 11 days, which is ideal, since it gives the researchers plenty of time to synthesize the drug (about 2 days) and then let it pass through the body and accumulate at the target site (another 2 to 3 days).

But decaying particles come with certain challenges: In the case of ^{225}Ac, the alpha particle breaks free of the actinium nucleus with an energy of 5 to 6 MeV. This gives the daughters of the actinium a kick of about 100 keV, which is more than enough to tear through a molecular chain or a layer of cells, and send the daughters traveling through the body. The isotope ^{225}Ac eventually decays to bismuth, which has a 46-minute half-life and can be toxic if it builds up in the kidneys.

Robertson and his colleagues think they have found a solution: wrap the actinium in a layered nanoparticle to absorb the recoil energy and contain the daughter isotopes. The final product includes inner layers of lanthanide phosphate and gadolinium phosphate, and an outer layer of gold. The alpha particles still manage to escape the nanoparticle with only 0.1% energy loss, but after 24 hours 90% of the bismuth is contained in the nanoparticle or in nearby cells. Robertson says previous efforts to contain the bismuth byproduct of ^{225}Ac decay have succeeded in containing only 10 to 20 percent.

"We're close to the goal of 100% [retention of bismuth]," said Robertson. The gold nanoparticle is currently being tested in the first phase of preclinical trials. Now Robertson and colleagues will have to see if the retention of bismuth is good enough to justify using the drug in humans. It comes down to the same question that doctors must ask of so many cancer drugs–"Does the benefit outweigh the risk?"

WOMEN IN SPACE continued from page 2

Endeavour, and brought a photo of famed African-American aviatrix Bessie Colman with her. The first thing she saw from space was her hometown of Chicago. "It was such a significant moment, because since I was a little girl, I had always assumed I would go into space," she later recalled.

Jemison left NASA in 1993, held faculty positions at Cornell University and Dartmouth College, and founded BioSentient Corporation in 1999 to commercialize a biofeedback device based on techniques developed at NASA. In 1993, she realized another dream, appearing on an episode of Star Trek: The Next Generation (the first real-life astronaut to appear on the series).

Many women astronauts, from all over the world, have since followed in the footsteps of Tereshkova, Ride, and Jemison–57 in all, out of 534 people who have traveled into space. Others will surely follow.

ANNOUNCEMENTS

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came more open to the west. Colors became brighter and almost garish, and images depicted "western activities." Most importantly, as trade increased between east and west, new technology for making pigments was introduced in Japan that was utilized in later artistic techniques. "We tend to think that art and science and technology are separate, but here's a case where the technology impacts the art," he says. "If you can change the pigments, you change the depictions that are shown in the art."

Technology plays a starring role in the Met's Lab. "The most common question we get is 'what's in this painting (or sculpture or textile) and how did it get there?'" he notes. Leona and his colleagues (who currently include one physics postdoc) use various instruments and technologies, such as mass spectrometry, surface-enhanced Raman spectroscopy, x-ray diffraction and scanning electron microscopy, among many others, to solve their artistic riddles.

Jens Stenger, a PhD chemical physicist who did his postdoc at the Harvard Art Museums, is no stranger to employing intricate technology to examine artwork. As an associate conservation scientist now at Yale University's recently established Institute for the Preservation of Cultural Heritage, he works on scientific investigations into much of the university's collections. Common tools for him and his team include those used at the Met's lab, as well as gas chromatography, x-ray fluorescence spectrometry, UV-visible spectrophotometry and microfading and textile tensile testers. The microfading tester was developed by a scientist at Yale to examine extremely small areas from a work of art to nondestructively ascertain the potential for fading under certain lighting conditions.

At Yale, one set of problems relates to conservation and the use of certain compounds to treat, clean or preserve an object. Stenger and his group work with art conservators to determine what an object is made of and what chemicals can be used on it that will not cause it harm. Another set of problems delves into the historical aspects of an object. The group collaborates with art historians to answer questions about historical occurrences that can be revealed from the art itself (such as whether a painter worked in a certain part of the world) or to answer questions about the art from historical knowledge already known (similar to Leona's examinations of Japanese paintings). And the final area relates to authentication. "Recently we worked on a painting thought to be an early work of Diego Velázquez," says Stenger. A materials analysis in the ground layer of the painting strongly suggests that the work was done in Seville, where Velázquez had spent his younger days.

Physicists don't have to work for a museum or conservation center to contribute to the art world. Charlie Falco, a professor of physics and optical sciences at the University of Arizona (UA), carved a path for himself in academia. "I only have three interests in life: science, art and motorcycles," he says. As an expert in motorcycles and owner of one of the largest collections of English-language books on motorcycles, Falco was tapped to co-curate an exhibition at the Guggenheim in 1998 on The Art of the Motorcycle. "The museum needed someone to give scholarly credibility to the enterprise," he recounts, and since the world of art is small and the world of people who appreciate motorcycles as art is even smaller, Falco was invited to oversee the massive project. He hand chose every piece, 100 in total, and helped develop the tale that they told in the exhibit. "We had to have a reason for selecting the motorcycles," he explains. "They had to tell stories and convey knowledge," as well as show off their aesthetics.

On his next major project, Falco collaborated with painter David Hockney, who had speculated that the Old Masters had used some sort of optical device to create their detailed paintings. Upon his own examination of some works, Falco immediately noticed the same thing, and the two began working together to prove their hypothesis. Communicating mostly by faxes, "it was the most intense period of scientific collaboration I have experienced in my life," he says. The result was the now famous Hockney-Falco thesis, which demonstrated that painters from the Renaissance on had used various optical technologies such as a camera obscura, camera lucida, and curved mirrors in crafting their masterpieces.

On the other side of the UA campus, assistant professor Robert Erdmann, a materials scientist and mathematician, currently spends about 90% of his time designing and developing computational algorithms and visualization techniques that reveal the secret life of paintings. "A painting or art object is so complex when viewed from a materials science standpoint," he says. "It has very diverse materials coming together at different length scales, which makes for a very complex problem." But with a whole array of imaging techniques currently available, and more being invented, there has never been a better opportunity to dig deeply into a painting's past.

In one of his most exciting projects, Erdmann was able to prove that three paintings previously thought to have been possibly painted by different artists all came from the same workshop. Using image processing and x-radiography, he demonstrated that the thread spacing patterns of the canvases for all three objects were exactly the same, thus showing that their canvases came from the same bolt of material. Erdmann also used his expertise to invent a visualization technique called a "curtain viewer," which allows people to view on the internet overlays of paintings taken with different wavelengths of light, such as IR, UV, x-ray and visible, to compare the images all at the same time, across a wide range of magnifications. Another of his innovations gives viewers the chance to see paintings as three dimensional objects by changing the position of a virtual light source.

Whatever the ecosystem in which they operate, all of the scientists concur that their careers in art are exceptionally gratifying. "It's a huge privilege to spend so much time with the art and be so close to it," says Stenger. Indeed, "the enhanced access" is a big plus, echoes Leona. "I have the unique opportunity to speak with specialists and learn information about the art that is not part of the general narrative."

Alaina G. Levine is the author of Networking for Nerds *(Wiley, 2014) and President of Quantum Success Solutions, a science career and professional development consulting enterprise. She can be contacted through www.alainalevine.com, or followed on twitter @AlainaGLevine.*

APS is pleased to announce:

New Honors and a Change in the Frequency of the Delbruck Prize

Newly established Fellowship:

Ovshinsky Sustainable Energy Fellowship (Unit: GERA)
Deadline: July 1, 2014
http://www.aps.org/units/gera/awards/ovshinsky.cfm

Outstanding Doctoral Thesis in Astrophysics (Unit: DAP)
Deadine: August 1, 2014
http://www.aps.org/programs/honors/dissertation/astrophysics.cfm

Richard L. Greene Dissertation Award in Experimental Condensed Matter or Materials Physics (Units: DMP, DCMP)
Deadline: September 1, 2014
http://www.aps.org/programs/honors/dissertation/greene.cfm

A change in frequency:

Max Delbruck Prize
The Max Delbruck Prize in Biological Physics will henceforth be Awarded Annually (Unit: DBIO)
Deadline: July 1, 2014
http://www.aps.org/units/dbp/awards/delbruck.cfm

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rary fix but not to enshrine the credit with permanency without a lasting spending offset.

The temporary nature of the R&E tax fix was giving the high-tech industry fits, since there was never any guarantee that Congress would enact the annual patch in time. And sometimes Congress did miss the target date entirely, leaving industrial research and development in taxation purgatory.

The ceaseless congressional dithering carried substantial costs for America's innovation enterprise, and finally high-tech industry seemed to have made an airtight case. Ways and Means Committee Chairman Dave Camp (R-MI) and the Republican House leadership got behind the American Research and Competitiveness Act of 2014 and were preparing to bring the legislation to the floor for a vote.

But Democrats cried foul: Congress was under a "pay-go" rule, and the tax credit was being reported to the floor without an offset. The consequence would have been across-the-board spending reductions, including for social safety net accounts. And that brings me to the conversation at the Washington dinner.

It involved a strong supporter of science, whom I will call Rep. X, and a member of the Democratic leadership, whom I will refer to as Rep. Y.

Rep. Y: "You must not support the tax credit, since it will damage essential middle class programs."

Rep. X: "But I am known as Mr. Research, and the tax credit is essential for innovation, and economic growth."

Rep. Y: "I know, but our party's priorities at this point have to be focused on the middle class."

As a scientist, I was in Rep. X's corner, but as a politico I could understand Rep. Y's bias. Two days later, the House passed the bill 274 to 131 with more than two thirds of the Democrats voting against it and the president threatening to veto it.

The bottom line is that scientists shouldn't take either party for granted and must be prepared to make the most compelling case for federal support of research and education.

Science needs to have a dog in Washington but not as a friend. It needs to have a dog in the fight over shrinking resources.

The Back Page

The APS Corporate Reform Initiative: A Progress Report

by M.R. Beasley, APS President 2014

Last January in *APS News* Michael Turner discussed the formation of an ad hoc APS Committee on Corporate Reform (CCR). There he noted the remarkable success of APS as a scientific society, and that this success was achieved by making necessary bold changes over the years in how we run our affairs. In that spirit, the task for APS looking forward is to ensure that we have the institutional excellence to remain highly successful in a world that is increasingly international, complex and rapidly changing. Many other scientific societies have undertaken or are undertaking similar reform. Moreover, APS presidents going back many years have recognized the need to review and renew our governance.

"The task for APS looking forward is to ensure that we have the institutional excellence to remain highly successful in a world that is increasingly international, complex and rapidly changing."

Do not be alarmed at the word "corporate." We have been a corporation for over 100 years–a non-profit corporation that is legally responsible to its members. The issue at hand is to ensure good, forward-looking governance that will best serve our members and steadfastly preserve our culture and values.

So what has happened since January?

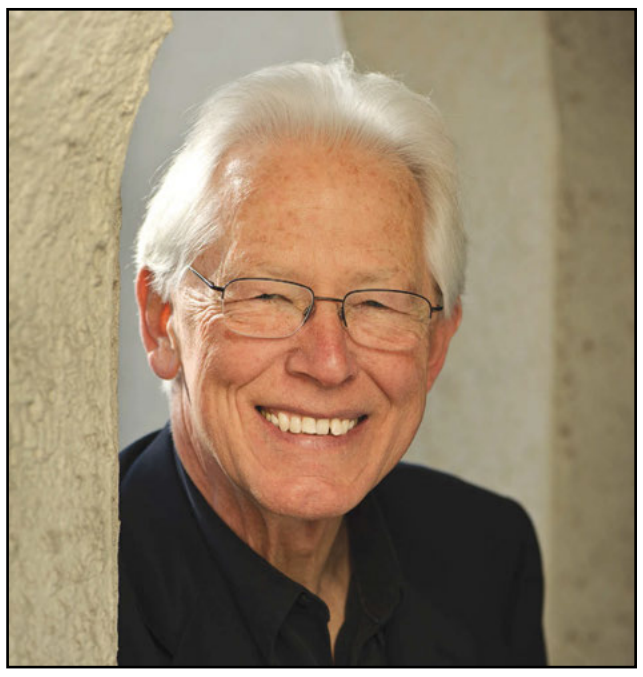
In the first phase, with the help of our consultants Cygnet Strategy, LLC, the Committee collected a large amount of data in the form of interviews with various people, both inside and outside of APS, about how they view the Society. In mid-February, these data were highlighted at the Leadership Convocation for the heads of divisions, topical groups, forums, regional sections, and committee chairs. Much helpful feedback was provided and many good questions were asked.

Following the Leadership Convocation, the CCR began its deliberations in earnest and developed a partial set of proposals for corporate reform. These were presented at a Town Hall at the APS March Meeting and in briefings of the divisional leadership present at that meeting. After additional work by the CCR, a more complete set of proposals was presented to the APS Council in early April. They described the origins and rationale for corporate reform, summaries of the data generated in the interviews, and a comparison of the governance structure of APS with several peer societies. Again, much helpful feedback was provided and many good questions were asked in the nearly day-long discussion by the Council. The same material was presented at a Town Hall at the APS April Meeting, and in briefings of the divisional leadership present. A video of that presentation is available on the CCR website (http://www.aps.org/about/reform). We have heard from viewers that it is a helpful introduction to the proposals being considered and their rationale.

Where are we now?

On May 13, the CCR reviewed all the feedback, as well as all of the questions asked by members through various channels. We then developed a comprehensive set of proposals for presentation to the APS Council on June 13 for further review and comment. Prior to that meeting, we will be holding briefing sessions for Council members so that they will be well informed on the specifics of the proposals and the objectives and reasons underlying them.

The APS Committee on Constitution and Bylaws, with help from legal counsel, has also begun the work of embodying these proposals into proper legal documents, so that the Council can see at its June 13 meeting how these proposals, if implemented, will translate into our governing documents. If the Council moves forward with these proposals, it will vote on the final proposals in July and the membership will vote in the fall. A major outreach to the APS membership is planned during the months prior to the vote to ensure that members have the information they need



to cast an informed vote.

What are the proposals?

These proposals deal with the top three bodies in our corporate governance: the Council, the Executive Board, and the triumvirate of senior operating officers (the executive officer, treasurer/publisher and Editor in Chief).

The APS is incorporated in the District of Columbia, and by district law every corporation must have a small Board of Directors that has the ultimate governance authority. It has overall fiduciary responsibility, strategic planning responsibility, and responsibility for oversight of the executive. It must also have a corporate treasurer to provide oversight of the financial performance of the corporation.

Currently, the APS Council has these responsibilities. Because the Council is large and meets infrequently, these roles have in fact been carried out by the smaller Executive Board for many years. This misalignment of roles and responsibilities needs to be corrected. The proposed plan does this. At the same time, there is a desire to increase the responsibilities of the Council and thereby give the members a strong voice in the governance of the APS through the Council, which is elected by the membership through the various Units in the Society.

"The Executive Board...would be replaced by a Board of Directors. The Chief Executive Officer...would, along with the Editor in Chief, serve as non-voting ex officio members of the Board.... The present Council would be repurposed to become the APS Council of Representatives (i.e., a member assembly)."

To achieve these ends, the present Executive Board would be eliminated and replaced by a Board of Directors. In effect, the present Executive Board would become the Board of Directors. The voting members of the board would include the presidential line (President, President-Elect, Vice President, and Past President), nine Council members elected for three-year terms by a repurposed Council, including a speaker of the Council (see next paragraph for changes to the Council), and a treasurer elected by the APS membership. Also, there is provision for one member-at-large appointed by the Board for needed expertise or to achieve better balance. Finally, the Chief Executive Officer, a newly created position, would, along with the Editor in Chief, serve as non-voting ex officio members of the Board. The principle operating here is that the CCR believes all voting directors should be elected by the membership, either directly (as with the Presidential Line and the Treasurer) or through their representatives (as with the Council members that are on the Board). The one exception is the member-at-large. The APS President would serve as the chair of the Board.

The present Council would be repurposed to become the APS Council of Representatives (i.e., a member assembly). Importantly, the Board would delegate full fiduciary responsibility for matters of science and science policy to the new Council. A new position of Speaker of the Council would be created. The speaker's job is to manage the work of the Council and formally represent the Council on the Board of Directors. The elected members of the Council would be selected as they are now, with the executive staff represented by the Chief Executive Officer and the Editor in Chief, both in a non-voting ex officio capacity. The President Elect would chair the Council. The Speaker and the APS President-Elect would be jointly responsible for establishing the agenda of the Council.

Also, importantly, oversight and reporting of the 20+ APS committees will be divided between the Council and the Board, with joint responsibility applying where appropriate (e.g., the Physics Policy Committee, the Panel on Public Affairs, and the Publications Oversight Committee). This will allow closer coupling of APS committees to the Board and Council and thereby facilitating more member input and guidance to APS programs.

"These proposals are still a work in progress, and we welcome feedback as we work collectively together to ensure the excellence of APS going forward."

At the executive level, creating the full-time staff position of Chief Executive Officer (CEO) would ensure that one person has responsibility and accountability for the coherence of operation over the entire APS (furthering the goal of "One APS" articulated in the APS Strategic Plan), enabling better efficiency in making decisions and setting priorities. The CEO oversees the day-to-day operations of the Society. The CEO also partners with the President to guide the strategic foresight and preparedness of the APS. Either the President or the CEO would act as the spokesperson for APS, depending on the issue. The CEO would be appointed by the Board of Directors through a comprehensive search.

Because of the critical importance of the APS journals in our mission and external reputation as a society, the Board of Directors and the CEO would jointly appoint the Editor in Chief (EiC) through a comprehensive search process, much as we do now, with members of the Council on the search committee. The EiC would report administratively to the CEO.

Everyone agrees that the functioning of governance bodies (the new Board, Council and Executive) must honor the values of APS and should operate in a spirit of shared responsibility and collaboration.

Finally, these proposals are still a work in progress, and we welcome feedback as we work collectively together to ensure the excellence of APS going forward.

Malcolm R. Beasley, APS President for 2014, is Sidney and Theodore Rosenberg Professor of Applied Physics at Stanford University.

For more information, including video presentations and background documents, please go to the APS Ad Hoc Committee on Corporate Reform Website (http://www.aps.org/about/reform). This website also has a comment form for members to submit feedback on the proposals.

APS News welcomes and encourages letters and submissions from its members responding to these and other issues. Responses may be sent to: letters@aps.org