2017 APS General Election Results
By David Voss

Voting in the 2017 APS General Election came to a close on July 31, and the results are in: Philip H. Bucksbaum of Stanford University has been elected vice president, Larry Gladney of University of Pennsylvania becomes chair-elect of the APS Nominating Committee, Ahmadou Wagué of Dakar Cheikh Anta Diop University in Senegal will be international counselor, and Vivian E. Ercina of the City University of New York/College of Staten Island will become general councilor. Their terms begin January 1, 2018.

Philip Bucksbaum holds the Marguerite Blake Wilbur Chair in Natural Science at Stanford University, with appointments in Physics and Applied Physics, and in Photon Science at SLAC. His current research is in laser interrogation of atoms and molecules to explore structure and dynamics on the femtosecond scale. Bucksbaum is a Fellow of APS and has been elected to the National Academy of Sciences and the American Academy of Arts and Sciences. Within APS he has been active in the Division of Atomic, Molecular, and Optical Physics and the Division of Laser Science. He has served as a Laser Science Divisional Associate Editor for Physical Review Letters (PRL), he was a member of the 2013 PRL Visiting Committee, and he has served on the APS Executive Board. As vice president in 2018 he joins the APS presidential line and will become president-elect in 2019 and president in 2020.

“I am honored to be elected, and I look forward to the opportunity to serve the members and the Society,” said Bucksbaum. “I know we are facing challenges, in funding and in the changing landscape for international cooperation, in the future of journal publishing, in the future of federal funding for physics, as well as other areas. There are also tremendous opportunities in physics in the 21st century, and APS has an important role in communicating ELECTION continued on page 4

Larry Gladney

2018 APS Medal for Exceptional Achievement in Research Awarded to Eugene Parker
By David Voss

The APS Council Steering Committee has voted to award the Society’s 2018 Medal for Exceptional Achievement in Research to Eugene Parker, professor emeritus at the University of Chicago. Parker, 90, is recognized for his “many fundamental contributions to space physics, plasma physics, solar physics, and astrophysics during the past 60 plus years.”

“Eugene N. Parker is the dean of the field of space and astrophysical plasma physics,” commented Louis Lanzerotti of the New Jersey Institute of Technology. “Parker’s seminal theoretical work beginning in the mid-1950s revolutionized our understanding of the solar corona and its production of the interplanetary medium, and the effects of the medium on Earth’s space environment.”

Parker’s theory of the solar wind led to a new understanding of the interplanetary medium. In particular, he predicted that the interplanetary magnetic field would be locked into the coronal plasma and would exhibit a spiral shape as the solar wind carried it into the region known as the heliosphere.

“There are very few scientists in the history of science of whom it can be said that they were responsible for the establishment of an entire scientific discipline,” said Lennard Fisk of the University of Michigan. “In the late 1950s, PARKER continued on page 4

NSF Grant For Women in Physics
By Rachel Gaul

Regularly drawing 19 million viewers each year, the comedy TV sitcom The Big Bang Theory is premiering its 11th season in late September 2017. The male four some featured in the show—two Caltech physicists, an astrophysicist, and an aerospace engineer—who don’t fit the male nerd image—are they welcome? Thanks to a $3 million grant from the National Science Foundation (NSF), researchers from Florida International University (FIU), Texas A&M University-Commerce, the American Association of Physics Teachers (AAPT), and APS will begin a multi-year project to encourage more women to overcome the negative stereotypes and enter the field of physics.

“The Big Bang Theory” is a funny show, and the ‘nerd’ stereotypes are funny... but we need to change the ‘Big Bang Theory’ view of what a physicist or a physics student looks like,” Zahra Hazari told APS News in an interview. Currently an associate professor of physics at FIU and the lead investigator of this project, her research has centered on reforming the physics learning environment to raise the participation of underrepresented groups who pursue physics, especially women.

“[Shows like these] are hugely detrimental to opening up doors for people who have never considered the field, because they don’t look or act the right way,” Hazari said. “…you don’t have to act that way and be that way to do physics, you can be a caring and nurturing woman. My research is about mythbusting.

NSF GRANT continued on page 6

Researchers stored Muybridge’s famous galloping horse film in DNA

By Rachel Gaul

A decade-long study of a distant galaxy has uncovered the first evidence of orbital motion in a pair of supermassive black holes (SBHs). This type of black hole—often more massive than a million stars—is found at the center of many galaxies, including our own, but only a handful of SBMBH pairs have been observed so far. The radio galaxy 0402-379 hosts the closest known SBMBH pair, estimated to be 24 light years apart from Earth. Researchers monitored 0402-379 from 2003 to 2015 with the Very Long Baseline Array, which is a system of ten radio telescopes spread across the U.S. An analysis of this data by Bansal et al., presented in the Astrophysical Journal (DOI: 10.3847/1538-4357/aa74e1), shows that the black holes are moving relative to each other. From our planet’s vantage point, the information-bom is a shockwave 1.6 microseconds per year. By making assumptions about the orbit’s shape, the researchers estimate that it will take 28,000 years for a full revolution. At this rate, the pair will not be merging

RESEARCH continued on page 6

Movie Archived on DNA Molecule

A research team has stored a short digital movie inside the DNA of live bacteria. DNA—our genetic information—has been known to have the potential for encoding information at high density. In 2013, scientists managed to encode 739 kilobytes of information into a synthetic strand of DNA, sufficient to store simultaneously all 154 of Shakespeare’s sonnets, one image, and a 26-second excerpt of Martin Luther King’s “I have a dream” speech. Now, Shipman et al. have further boosted DNA’s information-carrying capacity, reporting in Nature (DOI: 10.1038/nature23017) the first archiving of a moving picture inside a living cell. The researchers first encoded the black-and-white pixels of the movies’ frames into the four “letters” of the DNA string—the A, G, C, and T nucleobases. Using the new gene- editing technique called CRISPR, they then placed the DNA into an E. coli bacterium. The movie’s frames could later be retrieved by sequencing the cell’s DNA. The stored movie was Edwardw Muybridge’s The Horse in Motion, a groundbreaking motion picture recorded in 1878 through stroboscopic photography. With the new DNA technique, the authors found they could accurately reconstruct each frame of the movie.

Twirling Black Holes Caught in the Act

A decade-long study of a distant galaxy has uncovered the first evidence of orbital motion in a pair of supermassive black holes (SBHs). This type of black hole—often more massive than a million stars—is found at the center of many galaxies, including our own, but only a handful of SBMBH pairs have been observed so far. The radio galaxy 0402-379 hosts the closest known SBMBH pair, estimated to be 24 light years apart from Earth. Researchers monitored 0402-379 from 2003 to 2015 with the Very Long Baseline Array, which is a system of ten radio telescopes spread across the U.S. An analysis of this data by Bansal et al., presented in the Astrophysical Journal (DOI: 10.3847/1538-4357/aa74e1), shows that the black holes are moving relative to each other. From our planet’s vantage point, the information-bom is a shockwave 1.6 microseconds per year. By making assumptions about the orbit’s shape, the researchers estimate that it will take 28,000 years for a full revolution. At this rate, the pair will not be merging

RESEARCH continued on page 6
Undergraduate students have enough to worry about just getting through E&M, thermodynamics, and lab courses; emergencies happen, and they can turn life upside down. But now students in the APS-NMC may get emergency financial assistance.

On August 1, the APS BEAM Fund began offering small grants to provide undergraduate mentees with monetary support to help them complete their degrees. And the fund offers rapid response: If approved, students can obtain funds as quickly as two days after they apply.

To be eligible, students must be pursuing an undergraduate degree in physics or a closely related field, and they must be part of the NMC as a mentee (for more on how to participate visit the NMC website at aps.org/nmc). Among the things that can be paid for with the emergency funds are medical expenses, childcare, transportation, and tuition. For complete information on allowable expenses and how to fill out an application, BEAM FUND continued on page 7

Spotlight on Development

Help Strengthen the Future of the Physics Community by Becoming a Member of the APS Legacy Circle

Dear Valued Member of the Physics Community,

We hope that APS has been instrumental in your career success. Now, we invite you to strengthen the future of the physics community by becoming a member of the APS Legacy Circle.

Some of you will soon receive a planned giving information packet that we hope will be useful in guiding your philanthropic decision-making. Estate gifts to support APS programs—that need not cost you in your lifetime—will enable the Society to better serve the professional physics community, help educate the next generation of physicists, and communicate the excitement of physics to the general public for generations to come.

Kindly use the form below to request additional information, and/or share with us your intentions and be counted as a member of the APS Legacy Circle.

Thank you for your consideration.

Sincerely,
Irene I. Lukoff
APS Director of Development

☐ I have included the American Physical Society (APS) in my estate plans.
☐ I would like to include the Legacy Circle.
☐ I would like to learn more about leaving a gift to APS in my will. Please send me the information.
ASAPNEWS

August/September 2017 - 3

News from the APS Office of Public Affairs

APS Members Make Gains with Science Advocacy
By Tawanda W. Johnson

AP members are making big moves to advance science advocacy, helping to ensure that the U.S. maintains robust science budgets to support the next generation of jobs and prosperity.

Dominic Calabrese, a physics professor at Sierra College in Roseville, California, working with the APS Office of Public Affairs (OFA), recently launched an op-ed in the "Aburham Journal," urging his representa- tive Tom McClintock (CA-4 th) to reject President Trump’s pro- posed cuts to science. McClintock sits on the House Committee on the Budget, and thus plays a key role in funding decisions.

A highlight of Calabrese’s piece—"Making Science Matter"—pos- posed 2018 budget would do considerable harm to scientific innovation that has positively impacted California’s $47 billion agricultural production, but also the millions of farms across the country.

Calabrese said it is crucial that scientists educate members of Congress on the importance of science.

“Very few politicians in Washington, D.C. and the state and local levels have a background in the sciences," he said. "They are making decisions on bills that directly affect the livelihood of many educators and professionals in the scientific community, and they are often given the OK by researchers regarding science funding.”

Calabrese added, "My involve- ment (in science advoca- cy) has given me the chance to make a difference in the lives of many members of the science community. It has also allowed me to be heard by my con- gressional representa- tive. Lastly, I hope my involvement has increased our con- gressman’s awareness of the sig- nificance of federal science funding.”

Calabrese took his advocacy a step fur- ther by meeting with McClintock’s staff in his local office, along with Greg Mack, APS government policy special- ist, to underscore key points in his op-ed. McClintock’s staffers—both locally and in Washington, D.C., have responded in a favorable man- ner toward the importance of fund- ing science.

“McClintock was on our advoca- cy target list, but he was a chal- lenge," said Francis Slakey, OPA interim director. “He represents a rural district with no significant members of the science community. It has also allowed me to be heard by my con- gressional representa- tive. Lastly, I hope my involvement has increased our con- gressman’s awareness of the sig- nificance of federal science funding.”

When do I get my flying car?

There are a host of other obsta- cles that must be overcome: Pilots must be trained, and even with- out pilots, government approved autonomous flight-control software will eventually be necessary; infra- structure needs for takeoff/landing/ recharging/air-traffic control must be met; battery safety in aircraft (certain phones are not allowed on commercial flights today due to the risk of battery fires) must be addressed; and a clear busi- ness model must be developed.

Convincing customers to board a plane with huge batteries could be a problem. Noise at urban verti- ports will likely meet with oppo- sition. And costs could be in the stratosphere.

The low energy-density of batteries and thus their weight is an issue; however, electric motors are much smaller and lighter than jet engines, allowing for greater efficiency. Unfortunately, pres- ent batteries do not store enough energy to power an electric plane over a useful distance. NASA is developing the X-57, a plane with 14 electric motors, to test-pilots and set it into a uniquely- designed wing. A battery-powered VTOL plane illuminates some of the challenges that product designers face in the 21st century. Better, cheaper energy storage is required to make many such products feasible. It is impor- tant for expanding the use of wind and solar energy sources, which are of little use when clouds block the sun or the wind is not blowing.

Energy storage from wind and solar may not require batteries, since portability is not necessary. Energy can be stored in thermal, kinetic, and potential forms. The most important criteria for utility-scale energy stor- age are long life, low cost, long-term reliability, and scalability. Advanced batteries may be useful but not always the best option for utility- scale energy storage.

The optimistic mood at BLD-X was due in large measure to two recent developments.

(1) All-solid-state batteries, where the conventional flamma- ble liquid organic electrolytes are replaced with solid materials, will reduce or eliminate the fire hazard for batteries. Ceramics and glasses are contenders, although development is more necessary.

(2) Batteries with a lithium (Li-)metal anode and a cathode containing primarily sulfur (S)

Careers Report

"Startup Stories" Encourage Physics Innovation and Entrepreneurship By Mary Ann Mort

For my final project in an elec- tronics and instrumentation course last year, I created a device that var- ied in colors on a strip of LEDs, according to audio frequencies. My goal was to cut down on the effort that goes into pre-programming lights for music concerts by letting the frequency filters do the work. But once my product was finished, I had no idea what to do next or how to present the market.

As the next semester started, my enthusiasm for the project died. I had no sense of the time it takes to develop a class for physics students on marketing, patents, and how to navigate the business world, I might benefit from producing more devices like the one from my final project. And what if there were a new kind of class, lab, or part of an existing class that covers how to take innovative ideas from prototype to product? Every semester, physics students are tin- kering away and making gadgets and gizmos to help make their lives more convenient—so why not find ways to bring these ideas to market?

In an effort to give students these real-world skills, APS is promoting physics innovation and entrepreneurship (PIE) education for physics undergraduates through the National Inti- tiative to Promote PIE (NIPI) proj- ect. This project brings together the efforts of six universities to develop a ''Startup Stories'’ teaching package. The purpose of the package is to help physics students commercial- ize new technologies that they cre- ate, as well as develop leadership, communication, and multi-discipli- nary team skills. These skills will not only serve the meager five percent of physics bachelors des- tined to be permanent physics fac-
APS Leadership and Staff Featured in Physics World

Physics World, the member magazine of the UK Institute of Physics, focuses on physics in the United States in the latest of their "Special Report" series. Among the articles is a round-table discussion with 2017 APS President Laura Greene, 2017 APS President-Elect Roger Falcone, and Francis Slakey, interim director of the APS Office of Public Affairs.

Also included is news coverage of physics in the U.S., commentary by U.S. Congressman Bill Foster, a Q&A with former director of the Office of Science and Technology Policy John Holdren, Robert Crease on the DOE laboratories, and more.

The digital version is free-to-read and available at physicsworld.com

Vernon J. Ehlers 1934-2017

By David Voas

Former Republican U.S. Congressman Vernon Ehlers, 83, died at his home in Grand Rapids, Michigan, on August 15. Ehlers was a nuclear physicist who won election to the U.S. House of Representatives in 1993, and served until his retirement in 2011, representing the 3rd Congressional District of Michigan. He was the first of a small, select club of three physicists, including former Rep. Rush Holt (D-NJ) and current Rep. Bill Foster (D-IL). He was a strong supporter of physics, research, science education, and a defender of the National Science Foundation.

"Vern was a serious scientist of some accomplishment," observed Rush Holt, Chief Executive Officer of the American Association for the Advancement of Science, about his former congressional colleague. "But he understood very early on that involvement in politics and public matters was not incompatible with serious physics research and teaching. Vern realized that there were opportunities and obligations to be involved in public affairs."

Holt noted that such a stance took some nerve. "Back when he was advising [former Congressman and U.S. President] Gerald Ford, it was not something a young physicist would normally do. It took the recognition that this was something a scientist could and should do."

Vernon Ehlers was a friend and a mentor to me when I entered Congress as the 3rd member of EHLERS continued on page 7

ELECTION continued from page 1

the joy and excitement of science to the public and to government."

Larry Gladney is the Associate Dean for the Natural Sciences at the School of Arts and Sciences and Edmund J. & Louise W. Kahn Professor for Faculty Excellence in the Department of Physics and Astronomy at the University of Pennsylvania. His research interests are in astroparticle physics and cosmology, and in the field of astroparticle physics for which he received the APS Edward A. Bouchet Award in 1997. He currently serves on the Program Committee for the Advanced Laser Interferometer Gravitational-Wave Observatory. Gladney is the Chair of the APS Forum on Outreach and Engaging the Public. He will serve as 2018 chair-elect of the APS Nominating Committee and then as chair in 2019. The committee is responsible for putting forward candidates for positions in the elected leadership of APS.

Ahmadou Wagué is Professor of Physics at the Dakar Cheikh Anta Diop University in Senegal West Africa, where he has been involved in teaching general physics, quantum mechanics, optics, atomic physics, and astrophysics. Wagué is a member of the Senegalese National Academy of Science and Technology where he is in charge of the Committee on Science Education and Relation with Young Scholars. He was elected Vice President of the African Physical Society when it was launched in January 2010, and is currently a coordinator of the International Steering Committee of the new African Optics and Photonics Society. He organized a national campaign called "Light to the People" in bringing Solar Lamps into schools in many remote villages without electricity in Senegal. Wagué is a leading member of the African Laser Centre in Johannesburg, where he works to develop laser facilities in South Africa, Senegal, Ghana, Cameroon, Kenya, Namibia, Tunisia, Algeria, Morocco, Ethiopia, and Egypt, among others.

Vivian Incera is Professor of Physics and the Dean of Science and Technology at the City University of New York/College of Staten Island. She is a high-energy theorist, although her research interests frequently cross the formal boundaries of other areas. Over her academic career, she has made important contributions to the understanding of the properties of strongly interacting matter under extreme conditions. As the new Dean of Science at the College of Staten Island, she has already spearheaded several initiatives to increase student success, foster faculty research, and promote the representation and success of women in the STEM fields.

Incera has served on the APS Committee on Minorities and as the Elected Chair of the Texas Section of the APS. She was the Dr. C. Sharp Cook Chair in Physics at the University of Texas at Austin and received a national award for Leadership in College-level Promotion of Education. See aps.org/about/governance/election/index.cfm for more information.

PARKER continued from page 1

as a young unentrusted professor at the University of Chicago, Gene Parker wrote his seminal paper on the acceleration of the solar wind, predicting that it would be a supersonic flow. This work was ridiculed by more senior, well-established astrophysicists." Parker’s prediction was confirmed by the Mariner 2 spacecraft in 1962 and by the Voyager missions.

“Gene Parker has a wonderful and exceptional record of seminal contributions … over the many years of his distinguished career," said Roger Falcone, chair of the 2017 APS Leadership and Staff Selection Committee. “It is remarkable to see so many effects that bear his name.”

After qualifying exams, counter proliferation, and group preparation sessions, the U.S. physics team set off for Yogyakarta, Indonesia in late July to compete in the 9th Annual International Physics Olympiad (IPho). The seven-day trip, from July 16-24, brought together over 360 high school students from 88 countries to put their physics skills to the test. This year, the U.S. team placed 8th overall in medal count, capturing three gold and two silver medals.

“We tied for eighth place in the medal count … about the same as last year,” said the chair in 2019. The committee is responsible for putting forth candidates for positions in the elected leadership of APS.

Ahmadou Wagué is Professor of Physics at the Dakar Cheikh Anta Diop University in Senegal West Africa, where he has been involved in teaching general physics, quantum mechanics, optics, atomic physics, and astrophysics. Wagué is a member of the Senegalese National Academy of Science and Technology where he is in charge of the Committee on Science Education and Relation with Young Scholars. He was

The 2017 U.S. Olympiad team (L-R): Jimmy Qin, Sanjay Raman, Michele Song, Shreyas Balaji, Kye Shi

Vivian Incera

See aps.org/about/governance/election/index.cfm for more information.

By Rachel Gaal

The 2017 U.S. Olympiad team set off for Borobudur Temple, Yogyakarta palace, and Tembi Village. Students made special dyed clothes, known as batik, and were able to play a part in making traditional music. As a welcoming gesture to the IPhO group, past-president of APS Ehlers was advising [former Congressman and U.S. President] Vern Ehlers was a friend and a mentor to me when I entered Congress as the 3rd member of EHLERS continued on page 7

perfect opportunity for students to calculate and explore the properties of a new seismic-detecting technology, called the parallel dipole line (PDL) magnetic trap. To relieve some of the test-taking jitters, the participants of IPhO were taken to Borobudur Temple, Yogyakarta palace, and Tembi Village. Students made special dyed clothes, known as batik, and were able to play a part in making traditional music. As a welcoming gesture to the IPhO group, past-president of APS Ehlers was advising [former Congressman and U.S. President] Vern Ehlers was a friend and a mentor to me when I entered Congress as the 3rd member of EHLERS continued on page 7

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See aps.org/about/governance/election/index.cfm for more information.
Education & Diversity Update

APS Releases Updated Statistics on Women, Minorities, and Education

Drawing on national databases, each year APS collects and produces a number of graphics and data files that document the participation of various groups in physics. To see the latest numbers and historical trends on physicist demographics, visit aps.org/programs/education/statistics. Thanks to Sam Montgomery from the New Mexico Institute of Mining and Technology for his help in assembling the data.

NMC Travel Awards for 2017 Dia de la Fisica Deadline: Sep-tember 21

The NMC Travel Awards are open to any woman physicist, or any woman who has completed her undergraduate studies in physics. Several women have been awarded NMC Travel Awards and will present at 2018 APS meetings. Check the website for information on how to apply! By Yvonne Chen

Nominate the next Woman Physicist of the Month by emailing the nominee's name along with a brief paragraph about the person. You can learn more at aps.org/wpm.

Faculty and student winners of prizes (with certificates) with the UGP President Professor Awadhallah (in the middle) at the 2017 annual recognition program for education and research in STEM subjects founded by Sultana Balaji from John Foster Dulles High School in Sugar Land, TX, Jimmy Qin of Seminole High School in Sanford, FL, Sunday Ramon of Lakeeside High School in Seattle, WA; Kye Shi of Monte Vista Christian School in Watsonville, CA; and Melissa Song of Missouri State High School in Fremont, CA. The American Association of Physics Teachers (aapt.org) has more information on qualifying exams to join the U.S. Physics Olympiad team.

The 48th IPhO was recently held in Seoul, South Korea. The 2017 IPhO awards were announced at the American Physical Society (APS) March Meeting in March.

Starting on page 3

By Sultana N. Nahar

Meeting Zher Samak, a post-graduate student from Gaza, Palestinian society pursuing her Ph.D. in the physics department of Cairo University, one would be surprised to learn just how much higher education in Gaza. Like most others, I was aware of their elementary and high schools but not much could I find on the only university in Gaza that offers a master’s degree in physics. The faculty members in different departments and in other universi-ties include students in their research programs, but not at the graduate level. Zher saved money as a school-teacher to pursue her Ph.D. degree in physics in Cairo University, where I taught her, and her daughter volunteered to contribute. She came to me asking whether she could join the course after her research advisor Professor Sherbini informed her about it. I welcomed her.

A tall, strong young woman in a blue abaya whose way of speak-ing showed determination and persistence in pursuing the degree. Zher stood out as different from other students with happy faces. She lived alone far from campus and used to take the bus every day carrying a heavy old laptop. Her laptop was the only computer she could not connect to the internet during the computerization workship on R-matrix and atomic structure codes that I was conducting. She took the final exam with a cold and a fever but did well. I offered her seat in our lab when she was finishing a new computer, but she refused politely saying that she needed only prayer for her success. She accepted it only after I managed to explain to her that for sincerity and performance in the course. Through Zher I came to know about the peace conference in Gaza, to which I wrote a letter of contact with her. I helped members in the physics department to become members of APS at no cost.

On March 14–15, 2017, UGP held its sixth International Conference on Science Development, and I was invited to be the keynote presenter in the inauguration session. Unfortunately I was not able to attend the Conference, but instead I sent my slides on “Atomic processes: From Universe to Cancer Treatment” with my Skype contact informa-tion to answer questions after the presentation. But due to a power outage in Gaza, Skype did not work, so a professor answered the questions. Participants came from the universities in Gaza, and from neighboring Arab coun-tries of Jordan, Kuwait, Qatar, and the city of Bečelheim, and I joined remotely from the U.S.

The research areas covered included basic science, environmental engi-neering, earth sciences, water and renewable/green energy, marine sciences, life and health sciences, and biotechnology, mathematics, and physics. The presentations covered interesting and modern topics titled such as “Zinc and Picrolax, a natural Medicine,” “Patients from Northern Gaza Strip,” and “Dispersion Characteristics of Graphene Surface Plasmon Four-layer Waveguide.”

I established a recognition pro-gram in STEM (science, technol-ogy, engineering, and mathematics) areas in IUG in 2015 to moti-vate and promote education and research in basic and applied sci-ences. The program gives 14 prizes, 7 for faculty members for high qual-ity research publications and best teaching skill and 7 to students for the best academic performances in the departments of physics, biology, chemistry, mathematics, and six departments of engineering. They were distributed for the first time in April 2017 at the end of IUG’s 2nd observation of the research week where various research activities were demonstrated. The winners of the prizes were also revealing. Of the faculty prizes, five went to female members and one to a female member who was from engineering. However, six of the seven student prizes went to female students. It was impressive to see the sincerity and devotion of the women, and I hope that such efforts will also be adopted by the men.

The author is a research profes-sor in the Department of Astronomy at The Ohio State University, Columbus, Ohio. She is a Fellow of the APS and known as the Iron Lady for extensive work on iron and nuclear astrophysics, the Iron Prize, and the Iron Project. She received her Ph.D. in physics from Wayne State University, Detroit, Michigan, in 1987. With A.K. Pradhan she co-authored the textbook Atomic Astrophysics and Spectroscopy of Plasmas. She is working on her online database NORAD-Atomic Data. She has been promot-ing STEM education and research in developing countries since 1995.

Science Research in Gaza in Palestine

By Sultana N. Nahar
Women in Physics (CUWiP)—timeframes are for intervention, but for women and what the critical upcoming research.

Hazari wants to tackle the preced-ing step of recruitment with her research, they work on things that ing undergraduate research at ourHazari explained. “It’s a very difficult task, but we [have] help from teachers that come from those demographic regions. If all goes as planned, there will be a nationwide rollout by 2019 with a targeted goal of reaching 16,000 educators. [16,000 teachers] is a daunting number,” Hazari admitted. But her efforts are region-specific, and wide includes help from APS and AAPT, who have a vast network of physics educators. “We [hope to] train regional teacher leaders who will go out and run workshops in their region, and include webinars for additional teachers throughout the country,” Hazari said. So, what is the APS Office of Public Affairs, Panel on Education and Applied Sciences, and Professor of Physics, Harvard University. She served as the Director of the Department of Energy’s Office of Science from 2015 until 2017, overseeing $5.5 billion in research funding as well as the management of 10 national laboratories. She was dean of the School of Engineering and Applied Sciences at Harvard from 2009 until 2014, and principal associate direc-tor for science and technology from 2007 to 2009 and deputy director for science and technology from 2004 to 2007 at Lawrence Livermore National Laboratory from 1978 to 2004. Murray held a number of positions at Bell Laboratories, including as Division Director at APS in 2006, and is a member of the National Academy of Sciences and National Academy of Engineering. She is a Fellow of the American Academy of Arts and Sciences.

A new measurement of the mass of the proton is the most precise to date and at the same time significa ntly disagrees with the previous consensus value. Heilfei et al. report the result, which they obtained by comparing the motion of a single proton in a magnetic field to that of a carbon ion, in Physical Review Letters (DOI: 10.1103/PhysRevLett.119.033001). The mass, which includes Coulomb corrections, is determined to be 1.6726231171 ± 0.000000070 amu.

The value of the proton mass is a key parameter in many aspects of chemistry and physics. The authors next plan to improve the experimental precision by reduc ing field inhomogeneities in the Penning trap—the main source of systematic error. For more, see the Synopsis in Physics, “Proton Mass: New Measurements”—Nanotubes Generate “Truly” Random Bits

Cell phones, computers, and even the Wi-Fi that you are using online 24/7. To protect pri vacy, information is encrypted with the help of true random number generators (TRNG), which create a random series of bits that are truly random. But as technology becomes smaller, and more powerful, it is more difficult to find random bits. One solution, according to the American Academy of Arts and Sciences,

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The value of the proton mass is a key parameter in many aspects of chemistry and physics. The authors next plan to improve the experimental precision by reducing field inhomogeneities in the Penning trap—the main source of systematic error. For more, see the Synopsis in Physics, “Proton Mass: New Measurements”—Nanotubes Generate “Truly” Random Bits

Cell phones, computers, and even the Wi-Fi that you are using online 24/7. To protect privacy, information is encrypted with the help of true random number generators (TRNG), which create a random series of bits that are truly random. But as technology becomes smaller, and more powerful, it is more difficult to find random bits. One solution, according to the American Academy of Arts and Sciences,
Double your exposure by giving an outreach talk in addition to your science talk!

FOEP will have contributed sessions at the 2018 APS March and April meetings. These talks do not count against your “one scientific talk” quota, so you can still submit a scientific presentation. We look forward to hearing about your work.

Upgrade for APS March Meeting Abstract System

Starting in September, abstract submissions for the 2018 APS March Meeting will be handled by an online management system called ScholarOne. The new online system features a simplified submission interface that allows abstracts to be saved in draft form and edited online until the submission deadline (November 3).

A number of changes have been made to the submission procedure as well: Abstracts must be submitted in HTML format using ScholarOne’s Rich Text Editor, and submissions will require an APS web ID and password to ensure that submitters are members of APS in good standing (or members of a reciprocal society).

For more information about the 2018 APS March Meeting and updates on the submission process, visit the meeting website at aps.org/meetings/march/abstracts.

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the bipartisan Ph.D. Physicists’ Caucus,” said Foster. “At the time I was elected, Vern had already spent more than a decade trying to bring logic and rational analysis to the deeply irrational business we were in. He understood both the need to insist on valid scientific analysis of technological issues like Ballistic Missile Defense and the separate need to apply one’s deeply held beliefs towards issues like environmental protection. Vern’s career will serve forever as a model to anyone thinking of using their technical knowledge to make Congress and our world a better place.”

Born in Minnesota in 1934, Ehlers received his bachelor’s and Ph.D. degrees in physics from the University of California at Berkeley. He carried out research at the Lawrence Berkeley National Laboratory and then joined the faculty of Calvin College in Grand Rapids. He entered the Michigan state House of Representatives in 1983. In 1993, he entered the U.S. House of Representatives after winning a special election to replace Rep. Paul Henry, who died in office.

Michael Turner, director of the Kavli Institute for Cosmological Physics at the University of Chicago and former APS President, served with Ehlers on the APS Physics Policy Committee. “Vern was the first Ph.D. physicist in Congress and he did us proud,” said Turner. “As they say, you only get one chance to make first impressions, and Vern made a good first impression for the physicists who would follow. He was bipartisan, low-key and wise.”

“He colleagues knew he had a science background, but he wasn’t pushy or preachy about it,” added Turner. “Instead, he was very approachable and a good communicator. He was generous with his time and over the years provided much wise counsel to the APS. When he stepped down from Congress, he bemoaned the growing polarization. He served at a time when science was bipartisan and we benefitted from the support of both parties.”
The Federal Budget, Part One: Physical Science Research and Development Funding for Fiscal Year 2018—a Call to Action

By Cherry Murray

Note: this article is based on a presentation given to the 2017 APS April Meeting in Washington, D.C. in January 2017, with an added mid-August update.

When I gave a presentation at the 2017 APS “April” Meeting last January, I had just completed my appointment as the Director of Science at the U.S. Department of Energy (DOE), which as the APS News readership knows is the largest funder of physical science research in the federal government. I hadn’t actually paid a lot of attention to the entire federal budget until I became a federal employee, and then I found it to be quite sobering.

In this Back Page article spread across two issues of APS News, I will first, in this Part One, cover some historical trends in U.S. research and development (R&D) funding, contrasted with that of some other nations, and then provide an update on the administration’s proposed budget for the next fiscal year (FY18) and a call to the physics community to respond.

In Part Two, in the October issue, I will give a short tutorial on the federal budget as a whole and where R&D fits into it, and I hope to have an update on the congressional budget marks for FY18.

The process and timeline by which the U.S. federal budget is built

The U.S. federal government is normally working on three annual budgets simultaneously. The budget for FY17, from October 1, 2016 to September 30, 2017, is being executed by agencies now. Let’s call that budget the FY17 budget.

At the same time, the FY-1 budget is under consideration by Congress; that budget (is normally) submitted to Congress by the president during the first week in February of FY, i.e., four months after the start of FY and eight months prior to the start of FY-1. Congress must assess this budget, usually through hearings and testimony, and enact 12 separate appropriations bills for the FY-1 budget. Because of the turnover in the presidential administration last January, submission to Congress of the president’s FY18 proposed budget was delayed until late May, and congressional budget hearings are just now being held for FY18 as I write this in late June.

Concurrent with congressional consideration of the FY-1 budget, the administration is formulating the FY-2 budget, a process led by the Office of Management and Budget (OMB) and negotiated separately with each agency; the formulation process can take as long as one year prior to submission to Congress.

Trends in Federal Spending on Research and Development

Why do governments fund research and development? It is not because, as we all know, science is beautiful! In 1945, after the major R&D effort that arguably won the war, Vannevar Bush, the first science advisor to the president, in his report Science: The Great Frontier made the case for federal government support of research. His argument was that industry does applied research and development, while the federal government must invest in basic research broadly underpinning both national security and the economy. This is best and brightest minds, which will be drawn to the nations with the greatest ecosystem for fundamental research, underpins technology and economic development. The U.S. Economists have shown that 85% of our economic growth is due to investment in R&D. Our committee and many others have worried about how the U.S. is losing its international lead in science and technology, how quickly that can happen, and how hard it would be to regain.

Relevant to physical science research is the “discretionary” spending portion of the federal budget, a yearly budget process for about a third of the entire budget of $3.7 trillion through the appropriations committees of Congress. This comprises about half defense and half nondefense spending. And the R&D part of each of those is about 10%, together a very small slice of the total federal budget—roughly 3%. Despite the importance of federal investment, and its relatively small percentage of the entire federal budget, the federal spending on R&D, as a percentage of gross domestic product (GDP), is going down. In fact, it is pretty much following the decreases in all discretionary budgets over the last thirty years: R&D went from 1.2% of GDP in the late 1970s to just under 0.8% in 2016.

The half of federal spending on R&D for defense is mostly for major systems development. Very little is for basic research—the basic research portion of defense R&D has been decreasing over the last 50 years. And non-defense R&D continues to go down as a percentage of GDP, despite all of the sound arguments to the contrary. There have been large fluctuations in the funding of types of non-defense federal R&D as shown in Figure 1: first starting in 1957, as a response to Sputnik, the Apollo program provided major funding for NASA. And then there was a blip in energy research during the oil embargo starting in 1973.

After that, there was the space station, a slight uptick in NASA in the mid 1980s, and a major increase in life-sciences and medical spending due to the war on cancer and doubling of the National Institutes of Health budget starting in the early 1990’s.

International trends in domestic R&D spending (industry and government spending) over time are both interesting and alarming as shown in Figure 2. In the U.S. and the European Union, R&D spending has been climbing nicely, but you can see the amazing skyrocket in the domestic R&D spending of China over the last 20 years. China has made it part of its 15-year plans to aggressively catch up. They have a plan to grow R&D in a comprehensive multi-year strategic program, with plans for a national lab and academic system to rival those of the U.S. and Europe. Science is international, and the only way to lead in science is to stay ahead of the competition. The global competition here is for the best and brightest minds, which will be drawn to countries with the greatest ecosystem for scientific R&D and industrial innovation. It is of strategic importance to the national security of the U.S. that cutting-edge biology, materials research, and high speed computers are now in China, and that both China and Europe are heavily investing in advances in quantum science and technologies, brain science and artificial intelligence, new energy technologies, and synthetic biology—on the cusp of major advances in science and industry.

Funding for Physical Sciences R&D in the FY18 Federal Budget

The administration’s proposed FY18 budget drastically slashes non-defense discretionary spending and R&D. Wild swings in R&D budgets are especially poor ways to manage a scientific workforce, and there is considerable pushback from Congress on this.

The administration’s FY18 proposed budget cuts to R&D spending in the physical sciences total about 12% of the Office of Science and 30 to 70% for applied energy program DOE. In addition there are proposed drastic reductions in the earth observation and environmental R&D programs across all government agencies.

These cuts if enacted in the DOE R&D budget would immediately trigger layoffs of roughly 25% of staff at the ten DOE Office of Science national laboratories, and reduce operations at the scientific user facilities by 11% to 40%, which would lose the ability to accommodate about 20% of the current user base, three quarters of which comes from academia. The DOE cuts, if enacted, would reduce the physics research funding directly going to universities by 20%, on top of reductions from other agencies. The drastic reductions in applied energy program R&D would cause the U.S. to lose its lead in technology development and economic competitiveness in the major global energy transformation happening in the next decades.

In addition, the reduction in science and energy funding at the DOE National Nuclear Security Administration defense labs would result in layoffs and be devastating to their ability to recruit and retain the best science and engineering staff, essential for their national security mission.

A Call to Action for the Physics Community

So what can the physics community do?

You can propose to your congressional representatives that the support of research in general, and in particular fundamental research, is an important investment in national security and the economy. This is best done through face-to-face discussions and by telling real stories of how your research or other research in their district has