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APS NEWS

A PUBLICATION OF THE AMERICAN PHYSICAL SOCIETY

GOVERNANCE

2020 APS President Philip Bucksbaum

Philip H. Bucksbaum holds the Marguerite Blake Wilbur Chair in Natural Science at Stanford University, with appointments in Physics, Applied Physics, and in Photon Science at SLAC. He was also the founding director of the Stanford PULSE Institute. Bucksbaum graduated from Harvard in 1975 and went on to the University of California at Berkeley where he received his PhD in 1980 for atomic parity violation experiments.

Bucksbaum is a Fellow of the APS, the Optical Society, and has been elected to the National Academy of Sciences and the American Academy of Arts and Sciences. He is also the recipient of the 2020 Norman F. Ramsey Prize in Atomic, Molecular and Optical Physics, and in Precision Tests of Fundamental Laws and Symmetries. Within APS he has been active in DAMOP and DLS. He has served as a Laser Science Divisional Associate Editor for *Physical Review Letters*, he was a member of the *Physical Review Letters* Advisory Board. [A full bio is available at aps.org/about/governance/leadership/board/president.cfm.]

APS News talked with Bucksbaum about his plans for the 2020 presidential year and the challenges and opportunities facing the physics community. The interview has been edited for length and clarity.

Q: How did you start out in physics?

In the 1970s, when I was an undergrad at Harvard, there was a lot of excitement in fundamental physics about the Weinberg-Salam model and the fact that the weak interaction and electromagnetism might be two manifestations of the same thing. A number of groups were coming up with ways to test that. In my senior year, I went out to different schools to see where I wanted to go to grad school. At Berkeley, the Commins group was using this cool new technology—tunable dye lasers—to study Weinberg-Salam. It turns out that one of the important tests is searches for parity violation in atomic photo-absorption. So, joining this effort was an easy decision and that's what I ended up doing for my PhD. I've been a laser jock ever since.

Philip Bucksbaum

At Bell Labs after graduation I became more interested in what you could do with lasers beyond precision measurements and I've never looked back. I've done quite

PRESIDENT CONTINUED ON PAGE 6

ETHICS

APS Efforts to Combat Sexual Harassment in Physics

BY DAVID VOSS

It is clear from a recent report from the US National Academies that sexual harassment is a pervasive problem in the sciences. But a paper published in 2019 in the APS journal *Physical Review Physics Education Research* presented survey data showing that nearly 75% of women undergraduates studying physics had experienced some form of harassment and a Back Page article in *APS News* (April 2019) offered personal testimonies of women who had experienced harassment in physics.

"Think of it this way—three out of every four women who go to study physics as undergraduates being harassed—this should be shocking to everyone," said Miriam Deutsch, chair of the APS Committee on the Status of Women in Physics (CSWP). "It's horrific."

Catalyzed by these reports, the APS Board of Directors unanimously approved a statement in July 2019 that carried an unequivocal message: "Harassment and discrimination in the conduct of physics is unacceptable" (see page 3 of this issue).

"The statistics are really disturbing. The statement sailed through the APS Panel on Public Affairs and the Board was very pleased with the wording," said APS CEO Kate Kirby. Such calls for change are only the beginning and the Society has been reinforcing its statements with a variety of

APS EFFORTS CONTINUED ON PAGE 5

MEMBERSHIP UNITS

The Forum on Industrial & Applied Physics

BY ABIGAIL DOVE

The Forum on Industrial & Applied Physics (FIAP) is a home for APS members who work in the private sector, as well as those broadly interested in entrepreneurial applications of physics and building greater connections between academia and physics-related industries—including the aerospace, automotive, semiconductor, software, and biophysics sectors.

FIAP arrived with a bang in 1994, drawing 4,500 initial members and establishing itself as the largest APS forum in under one year (see *APS News* November 1995). At present FIAP is nearly 7,000 members strong, making it the largest unit across the Society's 38 divisions, forums, and topical groups.

FIAP's healthy membership base reflects widespread interest from the APS community around the exciting industrial applications of physics. And with good reason: Industrial physics has been a revolutionary force over the past few decades, transforming physics discoveries of the 20th century into innovations like computers, cell phones, consumer electronics, and information technology.

Ichiro Takeuchi

What's more, industrial physics comprises a major part of the US economy: a recent APS report on the economic impact of industrial physics estimated that physics-based industries were responsible for a whopping 13% of national

FIAP CONTINUED ON PAGE 7

MEETINGS

The APS March Meeting Heads to Denver

BY LEAH POFFENBERGER

From March 2 to 6, more than 10,000 physicists from across the country and around the globe will gather in Denver, Colorado, to participate in the world's largest physics meeting. Across the five-day meeting, attendees will encounter an avalanche of opportunities to present research, collaborate with colleagues, and interact with other physicists from a variety of backgrounds. This year's APS March Meeting will be held at the Colorado Convention Center—the only convention center with its own 40-foot-tall bear.

While attendees will have more than 900 sessions to choose from, the March Meeting will offer a number of special events for early-career physicists, students, and the general public. A highlight of every March Meeting is the Kavli Foundation Special Symposium: This year's symposium, themed "Frontiers of Computation: Machine Learning and Quantum Computing" will take place on March 4 from 2:30 to 5:30. The invited speakers are Michelle Girvan (University of Maryland, College Park), Eun-Ah Kim (Cornell University) and Roger Melko (University of Waterloo), John Preskill (Caltech), and Patrick Riley (Google).

Several pre-meeting events will be held on March 1, including short courses hosted by the Division of Polymer Physics, the Topical Group on Data Science, the Topical Group on Statistical and Nonlinear Physics, and the Division of Soft Matter. In addition to six tutorials on topics ranging from noisy quantum devices to advances in medical sensors, the pre-meeting events will include a workshop on creating learning assistant programs (3:00 p.m.–6:00 p.m.), a first-time attendee orientation (5:00 p.m.–6:00 p.m.), and a meet-up for undergraduate students participating in Future of Physics Days (6:15 p.m.–7:00 p.m.).

After the first day full of scientific talks on March 2, the APS Prizes and Awards Ceremony will take place from 5:45 p.m. to 7:00 p.m. to honor the outstanding achievements of APS members. A Welcome Reception will follow (6:45 p.m.–8:00 p.m.). On March 3, meeting attendees will have a chance to mingle with editors of the *Physical Review* journals at the Meet the Editors Reception (4:30 p.m.–6:30 p.m.). A third reception on March 4 from 7:00 p.m. to 8:30 p.m.—the Diversity Reception—will provide attendees with an opportunity to network while learning about APS diversity efforts led by the Committee on Minorities, the Committee on the Status of Women in Physics and the LGBT+ physics group.

Early-career physicists, graduate students, and job seekers will have the chance to attend a lunch-time session on March 2, "Meet Your Future: Careers in the Private Sector," hosted by the APS

MARCH CONTINUED ON PAGE 7

Going to the APS March Meeting? Read this.

All APS meeting participants must follow the Code of Conduct. Read it here: march.aps.org/about/code-of-conduct/.

Need to report something? Use APS EthicsPoint—it is confidential, easy-to-use, and always available: **Online:** aps.ethicspoint.com **Hotline**: +1 (844) 660-3924

Revised 02/21/20

PROGRAMS

Education and Diversity News

2020 Physics Department Chairs Conference: Save the Date

The 2020 Physics Department Chairs Conference, sponsored jointly by AAPT and APS, will be held June 18–20, 2020 in College Park, MD. Registration information will be available in late January at go.aps.org/30Xa16h.

2020 PhysTEC Conference

Join PhysTEC from February 29 to March 1 for the nation's largest meeting dedicated to the education of future physics teachers—featuring workshops on best practices, panel discussions with leading experts, and numerous networking opportunities. Register now (go.aps.org/2GEAOLr) to hear from physics teacher education experts about policy advocacy, improving your physics program, and recruiting future teachers.

Communication and Negotiation Skills Seminar for Women

With support from the National Science Foundation (NSF), APS has trained women in physics to conduct professional skills seminars for students and postdocs at APS-sponsored meetings and at universities and institutions. Professional Skills Development Seminars are highly interactive workshops where participants will learn and practice communication and negotiation skills. For more information, please visit go.aps.org/2tUEm9s.

APS, with NSF support, will be hosting a Professional Skills Development meeting on Friday, April 17th, before the 2020 APS April Meeting. Travel support is available to cover transportation and hotel costs (up to $1000 per person) for all workshop participants. Registration for the workshop will remain open until capacity is reached. For more information, please visit go.aps.org/2O0PE2U.

THIS MONTH IN

Physics History

February 8, 1967: Joseph Weber Submits First Gravitational Wave Paper to PRL

This month marks the four-year anniversary of LIGO's groundbreaking announcement of the first direct detection of gravitational waves, ushering in a new era of multi-messenger astronomy. But for decades after Albert Einstein's general theory of relativity predicted the existence of gravitational waves, physicists assumed it would be impossible to detect them. Joseph Weber was the first to build an experiment to do just that, and while his claims of detection were later discredited, he helped found the field.

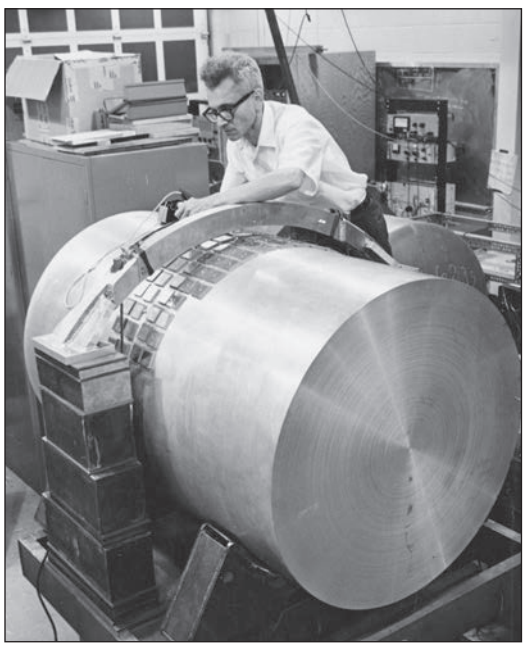
Born to Lithuanian Jewish immigrants in New Jersey in 1919, Weber's birthname was Yonah, which later morphed into Joseph. He enrolled at Cooper Union, but his schooling was a financial hardship for the family, and he dropped out to join the US Navy. He served as a radar expert and a navigator, and survived the sinking of the carrier *USS Lexington* during World War II, later taking command of a sub-chaser for an invasion of Sicily in 1943.

After leaving the Navy in 1948, Weber joined the electrical engineering department of the University of Maryland, earning a PhD in physics in his spare time from Catholic University—a condition of his hiring. He chose to study atomic physics and drew on his naval experience working with microwaves to come up with the concept for the maser, outlining his design in a 1952 public lecture in Ottawa.

Among those who read Weber's paper was Charles Townes, who had been working on a similar concept, as had two Russian scientists, Nikolay Basov and Aleksandr Prokhorov. The maser led to the invention of the laser, and Townes, Basov, and Prokhorov won the 1964 Nobel Prize in Physics for their work. Weber had been nominated but was omitted from the award. A disappointed Weber later told friends that the snub influenced his decision to hunt for gravitational waves, since it was a field that was so notoriously difficult, there would not be much competition.

During his 1955 sabbatical year, Weber studied gravitational radiation with John Wheeler at the Institute for Advanced Study in Princeton and came up with a way to potentially detect these faint ripples in the fabric of spacetime. His detectors were known as "Weber bars": large aluminum cylinders, about two meters long and one meter in diameter, that would vibrate at just the right resonant frequency in response to a passing gravitational wave. The bars were outfitted with piezoelectric sensors capable of detecting minute changes in the length of the cylinders.

The first bar was housed in his laboratory at UMD, with other bars installed roughly a mile from campus in a makeshift garage. Weber placed another bar at Argonne National Laboratory, the better to capture candidate "coincident events" and rule out false signals due to noise. And he devised his own algorithm to analyze the pulses, despite his lack of experience with statistics—a shortcoming that would later contribute to the dismissal of his claims.



University of Maryland Physics Professor Joseph Weber (1919-2000) with a gravitational wave detector. IMAGE: SPECIAL COLLECTIONS AND UNIVERSITY ARCHIVES, UNIVERSITY OF MARYLAND LIBRARIES

Weber submitted a paper to *Physical Review Letters* on February 8, 1967 (which was published the following month), reporting on the first two years of operation for his experiment. While the paper primarily placed some constraints on gravitational wave detection, he wrote, "The possibility that some gravitational signals may have been observed cannot completely be ruled out."

At a 1969 general relativity conference, he went further and announced success in detecting gravitational waves. It caused a sensation and launched Weber to academic fame. He published a paper in PRL that same year, claiming to have detected around two dozen "coincident events" over 81 days. In 1970 he followed up with another PRL paper claiming detection of 311 such events over seven months.

The problem was that nobody else ever picked up anything other than random noise when they tried

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APS BOARD STATEMENT

Ending Sexual Harassment in Physics (July 17, 2019)

Harassment and discrimination in the conduct of physics is unacceptable. While sexual harassment is understood to be a pervasive problem at all levels (NASEM report), APS leadership is appalled at the results of a recent survey of women undergraduates studying physics, which showed that nearly 75% of them experienced some form of sexual harassment in the previous two years [1]. Not only can this harassment be traumatic to the individual who is subjected to it, harassment also does lasting damage to the scientific enterprise by discouraging participation as well as undermining the collaborative environment needed for science to flourish.

To broadly uphold the important core values of diversity, inclusion, and respect, and to enable full participation throughout our physics profession, we should all become part of the solution.

We urge all members of the physics community to adhere to the standards of professional behavior developed by APS members and described in the APS Statement 19.1 - Guidelines on Ethics.

We ask leaders in academia, industry and government to:

1. Learn and help educate about various forms of harassment.
2. Train in how to effectively intervene when witnessing harassment.
3. Teach, train and mentor effectively, and welcome everyone as a valued colleague in the work of moving our field forward.

To support these efforts, APS:

- plays a major role in the leadership of the Societies Consortium on Sexual Harassment in STEMM: educationcounsel.com/societiesconsortium/.
- established an Ethics Committee, which will promote ethics education to inform the physics community and develop responses to accusations of ethics violations;
- is a leader among science societies in advancing federal legislation that enhances U.S. funding agencies' ability to combat sexual harassment in STEM;
- offers site visits to physics departments, in order to provide an outside appraisal of the environment experienced by women and minorities within the department;
- established and is enforcing a Code of Conduct at APS meetings, to ensure that the environment is welcoming to all participants and free of harassment; and
- developed an on-line system—aps.ethicspoint.com—that enables APS meeting attendees to report cases of harassment confidentially and anonymously.

As stated in the APS Strategic Plan: 2019, APS is committed to full and respectful participation by everyone. Physics thrives when all participants are treated with respect, so we must act now to end sexual harassment in our discipline.

[1] L. M. Aycock, Z. Hazari, E. Brewe, K. B. H Clancy, T. Hodapp, and R. M. Goertzen, "Sexual harassment reported by undergraduate female physicists," *Phys. Rev. Phys. Educ. Res.* **15**, 010121 (2019). DOI: 10.1103/PhysRevPhysEducRes.15.010121.

INTERNATIONAL AFFAIRS

US-China Physics Cooperation: Opportunities and Challenges

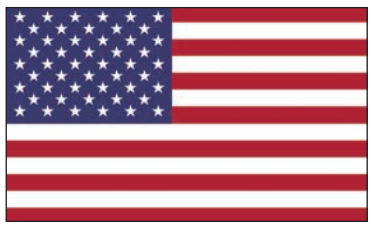
APS recently hosted high-level scientists from China for a two-day roundtable discussion on "US-China Physics Cooperation: Opportunities and Challenges. The meeting was held December 13-15 at the Airlie Conference Center in Warrenton, Virginia, a retreat-like venue that offered an informal atmosphere for exchanging perspectives on issues regarding international science collaboration between the two countries.

The roundtable included approximately 20 high-level representatives, with approximately 10 participants from both the US and the Chinese science communities, including Nobel Laureates, distinguished representatives from the Chinese Academy of Sciences, the Chinese Association of Science and Technology, the US National Academy of Sciences, US and Chinese universities, and other eminent physicists. During the roundtable, participants discussed opportunities for US-China scientific cooperation in areas such as astrophysics, biophysics, condensed matter physics, high energy physics, plasma physics, quantum computing, and science education.

The discussions were conducted under the Chatham House Rule (chathamhouse.org), whereby participants are free to use the information received, but neither the identity nor the affiliations of the speakers, nor that of any other participant, may be revealed. Consequently, the US and Chinese physicists openly discussed various concerns that have been expressed by their respective governmental and academic communities regarding research integrity, scientific mobility, and intellectual property.

Along with the roundtable discussions, the meeting program offered long breaks for informal conversations and socializing in comfortable breakout rooms with crackling fires in stone fireplaces. Participants also enjoyed after-dinner entertainment by "Greg Wilson & Second Wind," a bluegrass band led by a former university-level physics instructor.

After the roundtable concluded on December 16, participants from China, as well as the APS



Presidential Line, traveled to the National Science Foundation (NSF) in Alexandria, Virginia, for a meeting hosted by NSF leaders. The meeting allowed roundtable participants to discuss US-China research priorities and challenges with high-level NSF representatives.

Participants from both countries expressed their appreciation to APS for convening the roundtable and for initiating this opportunity for open exchange. It was hoped that such exchanges could continue, with colleagues from China offering to host a similar meeting in the future.

MEETINGS

Brewing an Interest in Fluid Science

BY ABIGAIL EISENSTADT

Taking courses in chemical engineering and physics can be daunting for college students without a background in mathematics, but sometimes all it takes is a stimulating beverage.

In a talk titled "Teaching Fluid Dynamics with Coffee" at the 2019 APS Division of Fluid Dynamics (DFD) meeting this past November in Seattle, William Ristenpart, a professor of chemical engineering at the University of California, Davis, shared how he and his colleague Tonya Kuhl have successfully created a chemical engineering course designed for engineering novices eager to try a new field of study. They entice students to enroll in the course by using a not-so-secret ingredient: coffee.

"The main goal is to teach them that chemical engineering is a way to think about the world quantitatively by using coffee," said Ristenpart.

Ristenpart and Kuhl first taught "The Design of Coffee" in 2013 to 18 students. In 2019, roughly 2000 students signed up to take what has become one of the most popular courses on campus. There are two versions of the class: one for engineering students and one for general education students. The general education course only requires a basic understanding of algebra, which makes it accessible for most undergraduates regardless of training.

"When you open a course up to students with tremendously different backgrounds, their quality of education is very different," said Ristenpart. "For example, we would talk about gravitational acceleration, where fluid drains by gravity. A lot of students didn't understand 'acceleration.' We really had to carefully define words that we engineers take for granted."

The first half of the general education class teaches students

Coffee in the classroom IMAGE: REETA ASMAI/UC DAVIS COLLEGE OF ENGINEERING

core principles like transport phenomena, chemical kinetics, and thermodynamics. One lesson involves reverse engineering a drip brewer, which shows how fluid mechanics principles operate inside coffee makers. The students learn how to use the conservation of mass to determine what amounts of water and coffee grounds yield exactly one kilogram of coffee—a tutorial that is helpful for the course's final assignment.

Students also get to roast green coffee beans. Roasting catalyzes a chemical process known as the Maillard reaction, in which sugars combine with proteins and turn the beans into their familiar brown color.

It is important that students learn to see coffee as a colloidal fluid, stressed Ristenpart in his DFD talk. Colloids are evenly dispersed microscopic particles that cannot be filtered out of a fluid and are able to change some of the properties of that fluid. When water is poured over coffee grounds, it removes some of the soluble substances and these are left behind as colloids.

However, the concentration of colloids depends on which device filters the coffee. For example, coffee from a French press usually has more colloids because the metal mesh does not filter the particles. Coffee's colloidal concentration affects its viscosity, which is sometimes equated as thickness. This is why French press coffee may seem sludgy, while coffee made differently may seem more watery.

After six weeks of chemical engineering fundamentals taught through grinding, roasting, and brewing coffee beans, Ristenpart and Kuhl challenge their class to complete the final design component of the course.

For the final, students compete in groups to brew one kilogram of the best-tasting coffee while using the least amount of total electrical energy. They receive a score calculated by dividing each group's coffee taste score over their total energy consumption (measured in kilowatt hours). The winners gain "fame, glory, and bonus points," according to Ristenpart.

As enrollment rates rose for his course, Ristenpart realized that although coffee was popular, coffee science was understudied and underfunded. So, he worked with the University of California, Davis to develop a comprehensive program committed to furthering coffee research in fields like bio-agricul-

BREWING CONTINUED ON PAGE 7

WEBER CONTINUED FROM PAGE 2

to replicate Weber's experiments. Groups at IBM, Stanford, Bell Labs, Oxford, Cambridge, and in Scotland, Germany, Louisiana, Italy, Moscow, and California, all tried to repeat the experiments with their own Weber bar designs—to no avail. IBM's Richard Garwin denounced Weber's claim publicly at an MIT conference in 1974. Theorists concluded that Weber's observations couldn't be correct because, as Garwin declared, "The universe would convert all of its energy into gravitational radiation in 50 million years or so, if one were really detecting what Joe Weber was detecting."

By the late 1970s, Weber's claims of detection had largely been discredited within the physics community. Weber himself was steadfast in his claims, dismissing one colleague who sought a meeting with the words, "You can't just walk in off the street and do gravitational wave experiments." His fame faded and funding dried up.

Weber died on September 30, 2000, while being treated for cancer, having continued his experiments until the end. One of his Weber bars is now displayed at the LIGO facility in Hanford, Washington, in recognition of his role in launching the search for gravitational waves. "No one else had the courage to look for gravitational waves until Weber showed that it was within the realm of the possible," Wheeler wrote in his autobiography.

Weber's second wife, Virginia Trimble, was on hand in February 2016 for the LIGO announcement and demurred on the question of whether she thought he had really detected gravitational waves. But she echoed the sentiments of many other leading physicists lauding Weber's pioneering role in getting the hunt off the ground. "I think if there had been two technologies going forward they would have pushed each other, as collaborators not as competitors," she told Science magazine. "It might have led to an observation sooner."

Further Reading:

Levin, J. *Black Hole Blues and Other Songs from Outer Space* (Knopf, New York, 2016).

Weber, J.,"Gravitational radiation," *Physical Review Letters* **18**, 498 (1967).

Weber, J., "Gravitational-wave detector events," *Physical Review Letters* **20**, 1307 (1968).

Weber, J., "Evidence for discovery of gravitational radiation," *Physical Review Letters* **22**, 1320 (1969).

Wheeler, J., Geons, *Black Holes, and Quantum Foam: A Life in Physics*. (W.W. Norton, New York, 1998).

GOVERNMENT AFFAIRS

Let Foreign Students Boost NC Tech Economy

BY AMBER LAUER

Note: This article was originally published in the Raleigh News & Observer *(December 9, 2019).*

Graduates celebrate during Duke University's commencement at Wallace Wade Stadium in Durham Sunday, May 13, 2018. The number of international science students applying to U.S. universities is in decline. IMAGE: ETHAN HYMAN/ *RALEIGH NEWS & OBSERVER*

The collaboration between American and international science students at universities across the US has led to breakthroughs that have transformed the lives of North Carolinians. The biotech and pharmaceutical industries, aerospace and defense, food manufacturing and information technology sectors—which dominate North Carolina's high-tech economy—all depend on the research done at universities and a pipeline of skilled workers.

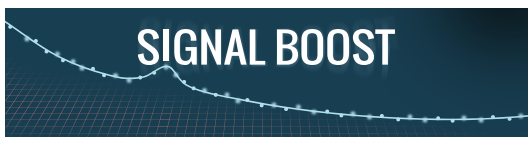
Unfortunately, the collaboration is in jeopardy, as the number of international students applying for physics PhDs at US institutions is now in a major decline. According to a survey by the American Physical Society, international applications to physics departments outside the top tier dropped 22 percent during the past two years. That's a serious problem because universities outside the top 15 generate more than 70 percent of the nation's PhDs.

The application decline is advanced warning of economic risk to the US. Our ability to attract the very best students in the world provides us a critical competitive advantage that imparts innovation and generates the highest caliber talent for our domestic industry. It also funnels wealth back into the communities that support the universities and industries.

Fortunately, US Sen. Thom Tillis is in a position to help put the US on the right track. Under current law, international students pursuing advanced STEM degrees in the US can be denied student visas if they intend to work in the US after they complete their degrees. By co-sponsoring the Keep STEM Talent Act, which would enable high-skilled international graduate students to both study at US universities and provide a path to a green card if they secure job offers from US employers after graduation, Tillis would help ensure the US continues to attract the best and brightest students from around the world.

Tillis serves on the Senate Judiciary Committee, which has jurisdiction over the bill. Moreover, he has established himself as a leader on immigration issues, and his platform states that he supports

FOREIGN CONTINUED ON PAGE 7



Signal Boost is a monthly email video newsletter alerting APS members to policy issues and identifying opportunities to get involved. Past issues are available at go.aps.org/2nr298D. **Join Our Mailing List: visit the sign-up page at go.aps.org/2nqGtJP.**

FYI: SCIENCE POLICY NEWS FROM AIP

Physics Funders Get Budget Boost for FY2020

BY MITCH AMBROSE

Federal agencies that fund physical science programs are receiving budget increases of varying sizes under the spending legislation for fiscal year 2020 that was enacted late last year.

The Department of Energy stands out as among the biggest beneficiaries, with several of its applied energy R&D offices seeing double-digit percentage boosts. For instance, the Office of Nuclear Energy budget is rising 13% to $1.5 billion, making room for a new $230 million program that will support advanced reactor demonstration projects.

Fundamental research is receiving more moderate increases, with funding for the DOE Office of Science rising 6% to an even $7 billion. The office's annual budget has now grown by nearly $2 billion over the course of the last five years.

This year's increases are spread across its six disciplinary programs, with most seeing increases in the range of 2% to 7%. However, the Fusion Energy Sciences program garnered an outsized boost of 19% to accommodate a near doubling of the U.S. contribution to the ITER facility in France, reflecting renewed confidence in the project's management. Overall funding for non-ITER activities will drop slightly though, squeezing the domestic fusion research portfolio.

The National Science Foundation topline is increasing 2.5% to $8.3 billion. The appropriation includes $65 million to launch a new program that will fund construction of midscale research infrastructure. It also includes the $33 million NSF requested to begin its five year, $150 million contribution to detector upgrades at the Large Hadron Collider in Europe, which will prepare them for the upcoming high luminosity upgrade to the collider's beams. DOE will contribute $100 million to the detector and beam upgrades this year.

The budget for the National Institute of Standards and Technology is increasing 5% to just over $1 billion. Much of the boost is targeted toward quantum information science and artificial intelligence research, areas that Congress and the Trump administration broadly agree on as top priorities.

Quantum science and AI are prioritized across other agencies as well. For instance, Congress directs the DOE Office of Science to allocate $195 million for quantum information science, a 60% increase over last year. The amount includes $75 million for establishing up to five research centers, as called for in the law that launched the National Quantum Initiative. NSF is directed to allocate $50 million for standing up its share of the research centers required under the initiative.

President Trump is scheduled to release his budget request for fiscal year 2021 on Feb. 10. Although Congress is apt to reject any proposals to slash science spending, as it has for Trump's past budget requests, it will face difficult choices this year in how to allocate any increases. Under a bipartisan budget agreement reached last year, caps on federal spending will only rise slightly in fiscal year 2021.

Nevertheless, some lawmakers have signaled an appetite for further ramping up spending in specific research fields. Last month, a bipartisan group of senators introduced the Industries of the Future Act, which would direct the White House to sketch out a plan for doubling federal spending on quantum information science and artificial intelligence research by fiscal year 2022. The plan would also detail options for increasing R&D investment in those areas as well as biotechnology, advanced manufacturing, and next-generation communications to $10 billion over the next five years.

The author is Acting Director of FYI.

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actions. "Our Code of Conduct is very important as is the reporting system for cases of misconduct. We've received feedback that people are pleased with the outcomes so far, but I'm concerned that women still feel reluctant to report these things," added Kirby.

Among the activities in place or underway are:

Code of Conduct. All participants in APS meetings must adhere to a Code of Conduct, which states in part: "Disruptive or harassing behavior of any kind will not be tolerated. Harassment includes but is not limited to inappropriate or intimidating behavior and language, unwelcome jokes or comments, unwanted touching or attention, offensive images, photography without permission, and stalking." Violators of the code are subject to actions from reprimands to ejection from the meeting, as well as alerting authorities in the most extreme cases (aps.org/meetings/policies/code-conduct.cfm).

APS EthicsPoint. Violations of the Code of Conduct can and should be reported. APS has opened an EthicsPoint portal to provide a comprehensive and completely confidential way to do this, either online via telephone hotline. As stated in the EthicsPoint guidelines: "EthicsPoint makes these reports available only to specific individuals within [APS] who are charged with evaluating the report, based on the type of violation and location of the incident. Each of these report recipients has had training in keeping these reports in the utmost confidence." To file a report, call +1 844.660.3924 or go to aps.ethicspoint.com.

Societies Consortium on Sexual Harassment in STEMM. APS is one of the inaugural members of the Societies Consortium on Sexual Harassment in STEMM, with APS Director of Programs Monica Plisch representing the Society on the consortium's leadership council (*APS News*, July 2019). The consortium provides model policies, policy-law guidance, and practical tools to advance professional and ethical conduct, climate and culture in societies' own operations and STEMM fields broadly, in support of the inclusion of all talent and excellence in the fields. (educationcounsel.com/societiesconsortium).

Legislation. APS, through its Office of Government Affairs, has been a leader in the efforts to enact legislation that helps US federal funding agencies combat sexual harassment in STEM. An example is the bipartisan Combating Sexual Harassment in Science Act, which would establish an Interagency Working Group to coordinate efforts to reduce sexual harassment, direct the NSF to award grants to institutions researching sexual harassment in the sciences with the goal of prevention and reduction, and require updates to the Academies report "On Being A Scientist: A Guide to Responsible Conduct in Research" (aps.org/policy/issues/harassment.cfm).

APS Ethics Committee. APS has traditionally issued statements on ethical matters, but in November 2018 the Society approved formation of a full Ethics Committee, which had its first meeting in June 2019 (*APS News*, July 2019). Committee Chair Michael Marder says that the committee will have a full and busy portfolio on all ethics-related matters, but two items are underway.

"We want to do a follow-up to a survey we did 15 years ago," says Marder. "Back then, nearly half of the early career physicists responded, many within a few hours, so we knew something big was happening. We want to know if things have changed—better, worse, or the same."

The other item is what do about members who have committed harassment. "We're inching up on draft policies about ineligibility for awards and revocation of honors or membership, but we don't have those in hand yet." (aps.org/publications/apsnews/201907/ethics.cfm)

APS Guidelines on Ethics. In April 2019, the APS Council adopted a new statement on ethics, which emphasizes that "The success of the scientific enterprise rests upon two ethical pillars. The first of them is the obligation to tell the truth, which includes avoiding fabrication, falsification, and plagiarism. The second is the obligation to treat people well, which prohibits abuse of power, encourages fair and respectful relationships with colleagues, subordinates, and students, and eschews bias, whether implicit or explicit" (aps.org/policy/statements/19.1.cfm).

Site visits. Since the 1990s, CSWP and the APS Committee on Minorities have provided, on request, independent appraisals of the environment experienced by women and minorities within a physics department or research lab. The goal is to suggest ways that leadership can institute interventions or changes to address practices that might limit or reduce participation by underrepresented groups. Information on setting up a site visit and a list of past site visits is available at aps.org/programs/women/sitevisits.

This is only a partial list of APS activities. Future efforts will include offering bystander training and allies programs at all APS meetings, exploring expanding EthicsPoint reporting to situations outside of meetings, and hiring an ombudsperson.

"Here's the thing. Enrollment of women in physics has increased, but if this number of 75% of women being harassed doesn't go down by a lot, then there will be no moving of the needle of female representation in physics," says Deutsch. "How much more of this can women take? If they see this when they are 18 or 20, why should they think it will get better when they are 30, 40, or 50? We need an emphasis on education, messaging, and personal modeling of the best behavior."

Additional Reading

L. M. Aycock, Z. Hazari, E. Brewe, K. B. H. Clancy, T. Hodapp, and R. M. Goertzen, "Sexual harassment reported by undergraduate female physicists," *Phys. Rev. Phys. Educ. Res.* **15**, 010121 (2019).

J. Libarkin, "Viewpoint: Yes, Sexual Harassment Still Drives Women Out of Physics," *Physics* 12, 43 (2019).

W. Rogers, R. Springer, and S. Yennello, "APS in the #MeToo Era," *APS News* (August/September 2018).

"Impressions from the APS Division of Nuclear Physics Fall Meeting," *APS News* (April 2019).

J. Gonski, "The Future of APS: Engaging Early Career Members for Equity and Inclusion," *APS News* (July 2019).

E. Conover, "APS Addresses Sexual Harassment Scandals," *APS News* (March 2013).

CAREERS

Job Hunting Made Easier

BY LEAH POFFENBERGER

Searching for a job—be it a first job or the next step in a career—can feel daunting and time consuming. For physicists looking for their next opportunity, the APS Career Fairs are here to help: Both the Division of Plasma Physics (DPP) meeting and the APS March Meeting offer job fairs or expos, open to members and non-members alike.

A number of recruiters from different sectors, from academia to national labs to industry attend DPP's job fair and March Meeting's job expo searching for qualified candidates from within in the physics community. Before each job fair, job seekers are given a chance to see what employers will be represented and what jobs have been posted in order to prioritize which companies to pursue for an interview.

The DPP meeting in 2018 had a record 102 job postings on offer. The most recent job fair, which took place at the 2019 DPP meeting in October in Fort Lauderdale, Florida, saw 95 jobs posted by 18 companies with 65 job seekers participating. These job seekers were also able to take advantage of a resume help desk to ensure their best chance of landing an interview.

"The job fair at the DPP meeting offers job seekers the opportunity to get advice on their resumes and CVs at Resume Help Desks that are staffed by DPP members from various sectors such as industries, universities, and labs," says Lesley-Ann Rennie, Career and Industrial Physics Coordinator at APS, who is largely responsible for organizing job fairs. "Job seekers can make appointments to meet with a volunteer for about 30 minutes to seek advice on their resume. This service has been proven to be very successful and we will continue to offer it in the future."

APS Career Fairs connect meeting attendees and recruiters from industry, academia, and national laboratories.

At this year's APS March Meeting in Denver, the Job Expo will be a 3-day event, likely drawing in an even wider variety of employers eager to hire quality candidates from among the huge pool of conference attendees. Before the event, participants can create a job seeker account, search for open positions, and even request an interview.

"At the DPP Job Fair, most of the companies recruiting are laboratories and universities. At the March Meeting's Job Expo there is a wider range of companies recruiting," says Rennie. "There are indeed many universities, but at March Meeting [recruiters] come from as far as China and Saudi Arabia. There are [national labs] participating, but the majority of the recruiters are from industry, such as Zurich Instruments, Microsoft, Intel Corporation, and Advanced Research Systems, to name a few."

Last year, a record 246 job seekers participated in the 2019 March Meeting Job Expo in Boston, and Rennie shared advice for this year's job seekers looking to stand out.

"Have an updated resume and bring enough copies to pass around. Do your research, find out which companies have posted jobs and will be at the job fair and find out as much as you can about the companies you would like to visit," says Rennie. "Be assertive and show

JOB HUNTING CONTINUED ON PAGE 7

HONORS

Mount Wilson Telescope Receives APS Historic Site Plaque

BY DAVID VOSS

APS selected the world-famous 100-inch Hooker telescope at the Mount Wilson Observatory in the San Gabriel Mountains of Los Angeles, California, as one of its Historic Sites. At a ceremony in October, 2019 APS President David Gross presented a plaque marking the site as the place where astronomers Edwin Hubble, Milton Humason, and Walter Baade made world-changing discoveries about the cosmos.

The observatory was founded in 1904 by George Ellery Hale (then-director of the Yerkes Observatory at the University of Chicago) with funding and support from the Carnegie Institution for Science. In 1906, John Hooker, a Los Angeles industrialist and amateur scientist, gave Carnegie a grant of $45,000 to purchase a 100-inch glass mirror for a large reflecting telescope. The Hooker telescope was completed in 1917 and was the largest optical telescope until 1948 when the 200-inch Hale Telescope was built at Palomar Observatory.

The plaque recognizes a number of seminal discoveries made with the telescope. Hubble joined the Carnegie Institution staff in 1919 and, while working at Mount Wilson, he showed that objects like Andromeda were entire galaxies outside the Milky Way. He and his assistant Humason discovered a linear relationship between the distances of galaxies and how fast they are moving away from Earth, evidence for an expanding universe.

2019 APS President David Gross (R) presents the Historic Site plaque to Thomas Meneghini (L), Executive Director of the Mount Wilson Institute.
IMAGE: KEIDA MASCARO

Another astronomer working at Mount Wilson, Walter Baade, studied the stars in the Andromeda galaxy and classified them into different groups based on their age and elemental constituents. This allowed him to make a more accurate estimate of the size and age of the universe.

Mount Wilson Observatory continues as a center of astronomy outreach and the Hooker telescope can be reserved for use by the public. The observatory con-

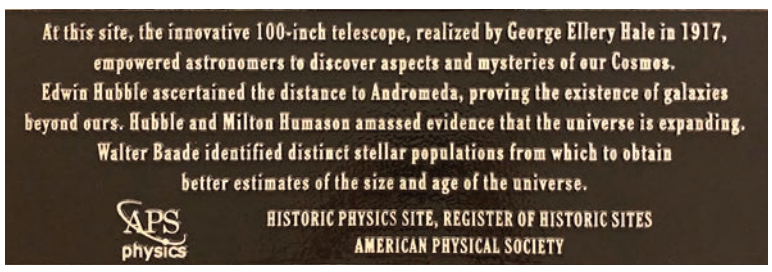
HISTORIC SITES CONTINUED ON PAGE 6

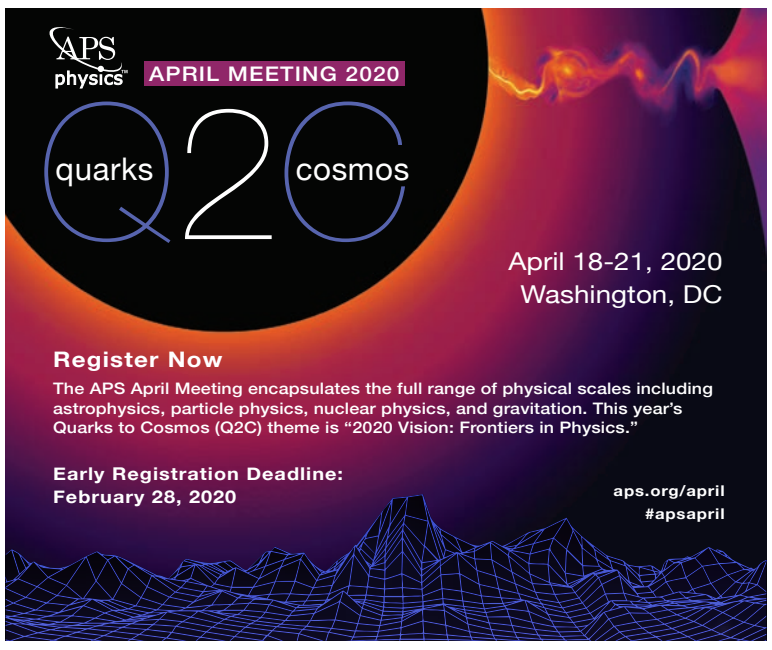
HISTORIC SITES CONTINUED FROM PAGE 5

tinues to be owned by the Carnegie Institution and is operated by the Mount Wilson Institute. For more information visit: mtwilson.edu.

The APS Historic Sites Initiative was created by the APS Executive Board in October 2004 with the mission to raise public awareness of physics. To date, almost 50 sites around North America have been honored with this designation. For more information about the initiative, please visit aps.org/programs/outreach/history/historicsites/.

Dome containing the 100-inch Hooker Telescope. IMAGE: CRAIG BAKER/WIKIMEDIA COMMONS





PRESIDENT CONTINUED FROM PAGE 1

a large array of different kinds of research made possible by ultrafast laser pulses. And of course, this has been the set up for the whole story of my career because the opportunity came along to get involved with research with x-ray lasers—an ultrafast source of angstrom wavelength light. That was too exciting to pass up. So, it's been a continuous path and I haven't really jumped fields. Some people absolutely love lasers and I'm one of those people.

Q: What are your priorities for your presidential year at APS?

It's really an honor to have this position. I've been an APS member since my undergraduate days. There is so much that the APS staff and our 55,000 members do for physicists and being able to be the leader of this great membership organization is a terrific privilege. Physics is good for you—fundamental research ultimately improves all of our lives. APS is in a position to speak for the community when there are issues that can directly affect the health of the community and our ability to do science.

As we start the year, front and center is an ongoing discussion of how to respond to growing calls for restriction on international scientific contact. I'm personally concerned that we must not do things that will threaten our ability to have global engagement in physics.

There are some cases where this is obvious. You can't have a gravitational wave observatory without having a worldwide aspect to it. It takes that kind of scale. And you could say the same about particle physics and CERN, and observational astronomy and other mega projects that require international contact.

This is true even in the smaller science done in individual labs, quantum information science for example, where the need for openness may be less obvious. Even though it's fundamental science, there are other groups competing with us. But it's the free aspect of that competition that drives innovation. If we were cut off from being able to talk to our competitors, the science would suffer quickly. And so, we're working on making that case.

Q: Some of these issues were discussed at the new APS Annual Leadership Meeting in Washington in January, right?

Yes. This meeting is an expansion of the annual leadership convocation that always happens at the end of January, beginning of February. We've expanded it to invite international participants, people from the federal science policy establishment, and have a round table discussion on these issues and to be able to better make the case for the importance of openness in science.

The APS leadership realizes that this is an extremely important issue. We're helped a lot by the fact that APS has developed an effective Office of Government Affairs and that office is getting members involved. In fact, thousands of our members are involved in some way or another in advocacy. And so when we speak, we can speak as a community and it's clear within government that we're the voice of the physics community.

Q: What else is on the agenda for the Presidential Line this year?

An important item is that our CEO Kate Kirby will be stepping down at the end of the year. And of course, she has been so important to APS. She became APS Executive Officer in 2009 before APS engaged in governance reform and she led us through that reform to become a more effective and up-to-date professional member society. And Kate also took on this job of guiding us to develop a strategic plan, published last year (APS Strategic Plan: 2019).

As president, I chair the APS Board of Directors, and probably the most important job of any board is to hire and oversee the CEO. That's job one. So we have a search committee working on this, and we've been getting good professional advice to carry out the search.

Q: How is the Strategic Plan working out?

Two years ago the priority was making the strategic plan and last year it was launching the strategic plan. And this year we will continue implementing it. In close conjunction with this is a focus on the APS culture—not only research integrity, or the staff culture, but all the ways that we treat each other as physicists and professionals and fellow humans. You could ask, should it really be the job of APS to worry about that? I would say that yes, if APS is to be effective in advancing its strategic goals and the physics community, then we need to have a healthy culture.

What does that consist of? First of all, there are things that are obvious but need work, such as advancing diversity, equity, and inclusion. For one reason or another, the profession of physics is not as inclusive as other academic disciplines. The numbers bear that out. For example, the percentage of African Americans in physics is very low. Women are underrepresented in physics. So, we know that we can do better and we want to figure out how to move in that direction as a Society.

Another area related to culture that has great importance is professional ethics. We now have a formal APS Ethics Committee, which is wonderful. They are working hard to oversee APS ethics policies, and provide us with constant guidance, and we expect the broader membership will benefit from that.

Q: Journal publishing is a big part of what APS does. How do you see that part of the Society?

Every scientific society's board of directors is interested in the future of publishing and we are too. Our *Physical Review* journals are terrific, and physics couldn't be physics without publishing at this highest level of scholarly integrity. In addition, many of the services that APS provides to the physics community are paid for by our successful publishing operation.

But we are concerned about the future of scientific publishing, and especially how changes in publishing over time may affect the process of academic peer review, and the financial viability of academic journals. For example, something that's been widely reported in the news is that government agencies like NSF have been asked by the White House to consider the ramifications of the "zero embargo time," that is, publishing papers with immediate free access to all, with no waiting period. That could have a very harmful effect on publishing, but there's a lot of uncertainty. We have to be part of that discussion and we are—we've been actively weighing in on that.

Q: What are your thoughts about the future of membership growth at APS?

I became a member of APS as an undergrad as I think a lot of people do, but it's really as a graduate student and postdoc that you come to know the organization. That's when you start going to meetings. That's when you start publishing papers. That's when you start paying attention to the technical exhibit floor at our large meetings and you start to make contacts with colleagues.

As an organization, we need to focus more of our membership activities on this group. Graduate students and postdocs are so important, and they make up a large fraction of our total membership. That's partly because students get a discount to join. Of course, that's an incentive, but another incentive has to be that we start serving them better because we know that they're the future of our profession.

One idea we started discussing last year is to have student chapters. It's a pilot project right now, but eventually I hope grad students may be able to go to a website and find out how to start an APS grad student chapter. We want to help those groups and understand what their needs are and then expand from there.

Q: One part of the Strategic Plan is financial sustainability. Can you say something about that?

People who are not in universities might not be familiar with the word "development," which means raising private money for good causes, in this case APS. This is something [Past President] David Gross has been very interested in and has been focusing on. Something I would like to target, and David and I agree on this, is the Congressional Science Fellows program. This is one of the real gems of what we do.

The program pays the salaries of scientists, often at the post-doc level, to go to work for members of Congress. They are not science advisors or APS advocates; they are regular congressional staffers on Capitol Hill who happen to have scientific knowledge and a science perspective, and they get asked to do all kinds of things.

But here's the problem. You have 535 voting members of Congress and only about 40 Congressional Science Fellows. Of those, APS supports two. When I was APS vice president, I chaired the committee that interviewed the applicants and we had such a good final group of prospective fellows. So why don't we have more fellows in Congress? It's not the lack of applicants and it's not because Congress doesn't want them—Congressional offices compete for these people. It's really about the money. This would be an ideal thing to raise money for and I hope we can make progress on it this year.

FIAP CONTINUED FROM PAGE 1

GDP in 2016 ($2.3 trillion) and up to 30% ($5.5 trillion) if indirect contributions are included.

Paradoxically, at a time when the impact of physics research is most visible in its industrial applications, the voice of industrial physicists in the APS community is comparatively small. While a majority of people with degrees in physics go on to work in the private sector (approximately 60% of physics bachelor's degree holders and 50% of physics master's degree or PhD holders), only about 6% of APS members identify as working in industry as opposed to academia, government, or national laboratories. Furthermore, most industrial physicists don't regularly attend APS conferences and meetings, therefore missing out on opportunities for networking and engagement with the latest fundamental physics research.

The reasons for the disconnect between the traditionally academic world of APS and the industrial physics arena are many. In large part this has to do with stark differences in the culture of graduate school versus the private sector, according to FIAP chair Ichiro Takeuchi, professor of materials science and engineering and affiliate professor of physics at the University of Maryland and co-founder of a startup focused on solid-state cooling technology.

"Physics prides itself on being a 'pure science' and the philosophy in graduate school emphasizes generating original findings," he explained. "The questions of highest academic interest are not necessarily in line with the questions that most need answering in industry." In short, "pursuing pure physics is orthogonal at some level to making better iPhones."

This sentiment was echoed by Steven Lambert, an industrial physicist with 25 years of experience in disk drive R&D who now serves as the Industrial Physics Program Manager for APS—a position specifically dedicated to implementing programs to engage physicists in industry (see *APS News* December 2013). "Some physics students are told that pursuit of pure knowledge is the highest good, so it may require a change of focus to work on the urgent problems facing a company."

According to Lambert, another issue is differences in the set of soft skills valued in industry as opposed to academia. "Physics graduate school doesn't necessarily train people for a collaborative, team-oriented environment since PhD research is often a rather solitary effort," he explained. "Communication and networking skills are also highly valued in industry, and some students are not ready for that."

FIAP exists to bridge this gap, helping APS better meet the needs of the industrial physics community and promoting awareness of the opportunities in this arena. These efforts are especially evident at the APS March Meeting, where FIAP typically sponsors or co-sponsors around ten sessions. These sessions are organized around FIAP's flagship "Industry Day," which has expanded over the years into a multi-day program with events spanning the entire meeting.

Lambert explained that a major focus of these sessions is to give graduate students and early career scientists exposure to career options in the private sector—something they may not have encountered thus far in their academic careers. FIAP's career activities involve a collaborative effort with the APS Committee on Careers & Professional Development and the Society's Career Programs Department, noted Crystal Bailey, the Head of Career Programs at APS. A perennial favorite is the annual "Meet Your Future" session, which involves a panel discussion and Q&A with physicists who work in the private sector.

Other FIAP-sponsored sessions slated for the 2020 March Meeting include "New Ways of Seeing with Data Science," "Seeing the Energy Future," "Imaging in Industry," and "Innovations from Industry."

In line with these efforts, APS has made a priority of "broaden[ing] the APS membership to include more physicists in industry and the private sector" in its most recent Strategic Plan (see *APS News* March 2019), committing to forging closer ties with industry, offering programs and workshops to address industry interest in physics research topics, and providing more mentorship opportunities and leadership training in industry.

These efforts appear to be having an impact, particularly with the newest generation of physicists. According to Takeuchi, students today are becoming more appreciative of the connectivity between physics and industry—particularly in subdisciplines like condensed matter physics and materials physics where the industrial applications are especially clear and are increasingly being discussed in graduate school curricula. "It's changing," he noted, "but I would say it's not changing fast enough."

Overall, FIAP stands out as one of the most ambitious APS units, working for greater recognition for and inclusivity of the physicists working in industry and as entrepreneurs, and acting as a conduit for students and early career scientists toward a rewarding career in the private sector. More information can be found at the FIAP website.

The author is a freelance writer in Stockholm, Sweden.

FOREIGN CONTINUED FROM PAGE 4

"a strong, merit-based legal immigration system based on the needs of America's economy and workforce." Furthermore, a White House spokesman has stated that the nation is committed to attracting the "best and brightest" students to boost America's competitiveness.

As a postdoctoral associate with a focus on nuclear astrophysics at Duke University, I've witnessed firsthand the synergy between American and international students as they tackle research addressing some of our nation's most pressing challenges. American students—brimming with innovative ideas, entrepreneurial spirit and novel ways to address scientific problems—fit seamlessly with their international counterparts whose mastery of scientific material is invaluable in the innovation process. Together, with a common scientific goal, they transcend cultural boundaries and achieve greatness in research to the benefit of our nation's scientific enterprise.

Locally, immigrants play key roles in our state's economy. Several Fortune 500 companies in North Carolina boast immigrant founders, including Bank of America, IQVIA, and Sealed Air.

Despite that success, North Carolina faces hurdles in boosting its high-tech workforce. According to a report by Burning Glass Technologies, 41 percent of all open job postings in the state are related to science, technology, engineering and mathematics. And, alarmingly, the number of unfilled high-tech jobs in the state continues to grow, topping 31,000—a whopping 40 percent jump from 2018 to 2019, according to the North Carolina Technology Association. I believe most of us share the same goal of maintaining American technological supremacy. The quality of our higher education system is a major factor in this objective.

History has proved that when American and international students collaborate on research, great things happen. Sen. Tillis can help maintain that collaboration and sustain our state's and nation's economy, by co-sponsoring the Keep STEM Talent Act—our best path forward toward ensuring the US remains a high-tech leader in an increasingly competitive world.

The author is a postdoctoral research associate with a focus on nuclear astrophysics at Triangle Universities Nuclear Laboratory, Duke University.

MARCH CONTINUED FROM PAGE 1

Forum on Industrial and Applied Physics and the APS Careers team (11:45 a.m. –2:15 p.m.). Another special event is the Careers in Physics Workshop: Putting your Science to WORK, a session led by career coach and author Peter Fiske on March 5 (2:30 p.m.–5:30 p.m.). The annual March Meeting Job Expo will be held on March 2 from 12:00 p.m. to 5:00 p.m., on March 3 from 10 a.m. to 5:00 p.m., and on March 4 from 10 a.m. to 4:00 p.m.

Undergraduate students will have the chance to participate in Future of Physics Days (FPD) events, sponsored by APS and the Society for Physics Students (SPS). FPD offers students the opportunity to present research, learn about graduate schools and careers, and network with others in the scientific community. An event on March 2, Connecting with Success: Networking Workshop for Physicists (5:45 p.m. –7:00 p.m.), will give students the tools to build their professional networks to discover opportunities. Students can also attend a graduate school fair on March 3 from 10 a.m. to 5:00 p.m. and the graduate school fair reception (2:30 p.m. to 4:00 p.m.). A student reception for both undergrad and graduate students to mix and mingle will follow from 5:30 p.m. to 8:30 p.m.

Four special events that will delight both physicists and the general public are planned: On March 3, condensed matter physicist Diandra Leslie-Pelecky Hilborn will give a public lecture on materials science and NASCAR racing titled "From Nanomaterials to NASCAR: Materials at 200 Miles per Hour" (7:30 p.m.–8:30 p.m.). On March 4, science and the arts will come together in a staged reading of the play *Einstein's Wife* from 8:00 p.m. to 9:30 p.m., and the Rock-n-Roll Physics Sing-Along, a popular March Meeting tradition, from 9:15 p.m. to 10:45 p.m. A new event at this year's March Meeting is based on the book "Thing Explainer: Complicated Stuff in Simple Words." Hosted by the Forum on Outreach and Engaging the Public, the event challenges presenters to test their communication skills by describing their research in only the most common 1,000 English words. All are welcome to watch physicists attempt to win prizes with simple explanations of complex topics on March 4 from 7:30 p.m. to 8:30 p.m. in room 601/603.

For more information on the 2020 March Meeting and the full scientific program, please visit march.aps.org.

BREWING CONTINUED FROM PAGE 3

tural engineering, sustainability, sociology, microbiology, and — of course — chemical engineering.

"There has been close to zero academic consideration of coffee in the United States," said Ristenpart, "... The main reason for that is that coffee is not grown here in the States, so there is no cultural or political impetus." The UC Coffee Center is dedicated to rectifying the absence of coffee research.

Now, Ristenpart is co-director of the Coffee Center and continues to teach "The Design of Coffee." Currently, he is collaborating with Kuhl on a third edition of their general education textbook. The two are also authoring a higher level chemical engineering textbook called "A Highly Caffeinated Introduction to Chemical Engineering." In the future, Ristenpart wants to write a textbook for coffee industry leaders who are interested in learning more about the science behind the beloved, but deceptively simple beverage.

The final exam is making the best coffee with the least energy. IMAGE: REETA ASMAI/UC DAVIS COLLEGE OF ENGINEERING

"In my opinion, it is actually more difficult to make a good cup of coffee than it is to make a good cup of wine," said Ristenpart, "Coffee goes through more unit operations, processes, and steps than wine does."

The author is the Science Communications intern at APS.

JOB HUNTING CONTINUED FROM PAGE 5

initiative as you move around to the various employers, and lastly, network with as many companies as possible and also network with your peers—try to find out their approach to building their own careers."

APS has been running job fairs at DPP and March Meeting for the past eight years, taking over for the American Institute of Physics in 2012. However, the past few years have shown a marked increase in both recruiters and job seekers attending these events. Crystal Bailey, Head of Career Programs at APS, attributes much of this success to having Rennie as an APS representative dedicated to marketing the event and building relationships with employers who continue to come back year after year.

"What tends to happen is if an employer comes once, they build a relationship with us and if they come once and they have a good experience, they come back. And I feel like we've just been gaining a lot of momentum in recent years by having new companies come and have a good experience. We've managed to successfully build some relationships with companies who frequently will use us as a recruitment opportunity," says Bailey.

In the future, job fairs might expand and be present at more APS meetings besides the DPP and March meetings, and Bailey hopes to even further increase the diversity of recruiters.

"We're trying to build relationships with other communities and other divisions [besides DPP] that might eventually lead to a formal job fair," says Bailey. "But then we also are very much interested in continuing to increase the industry participation in the existing job fairs, both DPP and March. We really want to see companies strongly represented at these events."

To sign up for the 2020 March Meeting Job Expo, visit march.aps.org/program/job-expo. Job seekers do not have to be meeting attendees or APS members.

THE BACK PAGE

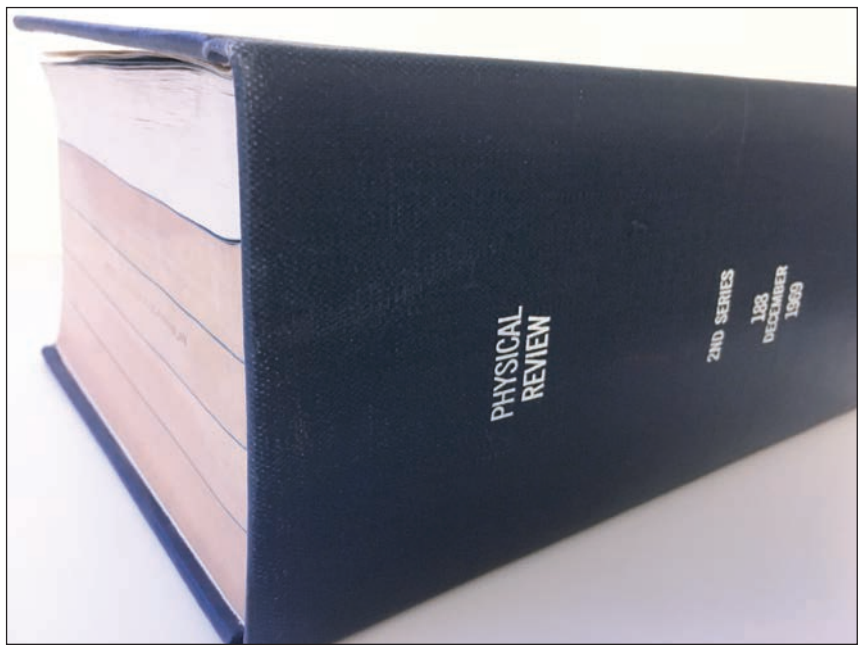
50 Years of *Physical Review A, B, C*, and *D*. Enduring discoveries. Tomorrow's advances.

BY MATTHEW SALTER AND MICHAEL THOENNESSEN

For the past 127 years, the *Physical Review* journals, published by the American Physical Society, have existed to serve the global physics and physics-related research community. Since their inception in 1893 the journals have set the standard for excellence in scholarly publishing and have continuously evolved to meet the changing needs of authors and readers, introducing innovations such as *Reviews of Modern Physics* (1919)—the world's most cited physics reviews journal—and *Physical Review Letters* (1958)—the world's most cited physics journal.

In 2020, we commemorate the 50th anniversary of the launch of *Physical Review A-D*—another major evolution of the *Physical Review* journals portfolio in the service of the research community—and will celebrate the proud heritage of our journals as well as looking to the next 50 years of the *Physical Review* journals. To celebrate, amongst other activities we plan to:

- **Feature landmark articles:** Throughout the year each journal will highlight on its website influential papers from its long history.
- **50 for 50 Discount:** For articles submitted in 2020, APS is offering a 50% reduction of article processing charges (APCs) for authors wishing to publish open access in the prestigious titles *Physical Review A-E*. This offer also extends to *Physical Review Letters* as well as the more recently launched sister journals *Physical Review Applied*, *Physical Review Fluids*, and *Physical Review Materials*.
- **Engage the Next Generation:** The future of scientific publication rests with the communication preferences of the future scientists. Thus, we will hold author engagement sessions for early career scientists at APS and other major meetings around the world to collect input and feedback to continue to optimally serve the community in the future.



The last volume of *The Physical Review* was a behemoth several inches thick.

"In 2020, we commemorate the 50th anniversary of the launch of *Physical Review A-D*—[a] major evolution of the *Physical Review* journals portfolio in the service of the research community—and will celebrate the proud heritage of our journals as well as looking to the next 50 years of the *Physical Review* journals."

Originally, *The Physical Review*—the largest journal in the portfolio—was published as a single volume of high-quality articles spanning all aspects of physics and physics-related research. This approach worked well for the first 77 years of the journal's life, but by 1970 it had become clear that the needs of the community would be better met by reorganizing the single printed volume—by then a monthly behemoth several inches thick—into a series of smaller high-quality topical journals each serving a focused research field and allowing readers to locate the newest information most relevant to their research. Thus were born *Physical Review A* (PRA, General Physics), *Physical Review B* (PRB, Solid State Physics), *Physical Review C* (PRC, Nuclear Physics) and *Physical Review D* (PRD, Particles and Fields). While the main intention of dividing *The Physical Review* into several smaller journals was to provide more closely focused venues for dissemination of groups of related research fields, it is said that the development was also welcomed by researchers and librarians alike for making it easier to lift printed volumes on and off library shelves!

In the ensuing 50 years, the *Physical Review* portfolio has continued to grow, both in number of journals and published articles in response to the demands of the community, and now numbers 14 peer-reviewed journals that in 2019 published more than 20,000 research and review articles. Some sense of the rate of growth of the journals can be seen by considering the fact that the December 1995 issue of *Physical Review B* alone contained more articles than the entirety of *The Physical Review* December edition in 1969. In addition to growth, the scopes of *Physical Review A, B, C and D* have continued to evolve to keep pace with the development of physics, which among other things led in 1993 to the creation of *Physical Review E* (PRE) covering statistical physics, plasmas, fluids, and related interdisciplinary topics out of *Physical Review A* which was refocused on atomic, molecular, and optical physics. In recent years, the portfolio has continued to grow and diversify with the launch of other focused journals publishing articles in applied physics, fluid dynamics, and materials research.

The *Physical Review* journals took another important step in serving the research community in 2011 by the introduction of a hybrid open access option to all of the research journals in the portfolio (*Reviews of Modern Physics*, as a specialty reviews journal is the only exception). Since that time authors have had the option to make individual articles in the *Physical Review* hybrid journals available open access immediately on publication upon payment of an APC. This move continued the Society's record of leadership in open access publishing that began as far back as 1998 with the launch of the pioneering open access journal *Physical Review Accelerators and Beams* (PRAB), followed by *Physical Review Physics Education Research* (PRPER) in 2005. In 2011 the APS introduced the highly selective *Physical Review X* (PRX)—the world's highest impact open access physics journal. In 2019 this was joined by the fourth and newest fully open access member of the family, *Physical Review Research* (PRResearch) that shares the acceptance criteria of the main *Physical Review* journals.

As *Physical Review A, B, C, and D* and the rest of the portfolio chart their future course into the next half century they will be guided by the APS Strategic Plan: 2019, created by the members, leadership, and staff of the American Physical Society and published at the start of 2019. At the heart of this blueprint is the mission of the APS journals to serve the global scientific community by providing the preeminent international venue for the curation and dissemination of physics and physics-related research. To achieve this goal it will be necessary to further grow and diversify the publishing footprint of the *Physical Review* journals and develop more publishing options to meet the needs of our authors and allow them to navigate the evolving landscape of institutional and funder mandates. The future is one of challenge and opportunity and will require the Physical Review journals to display the flexibility and capacity to change in response to the needs of the community that have been their hallmark.

"The *Physical Review* journals took another important step in serving the research community in 2011 by the introduction of a hybrid open access option to all of the research journals in the portfolio."

"For articles submitted in 2020, APS is offering a 50% reduction in article processing charges (APCs) for authors wishing to publish in the prestigious titles *Physical Review A-E*. This offer also extends to *Physical Review Letters* as well as the more recently launched sister journals *Physical Review Applied*, *Physical Review Fluids*, and *Physical Review Materials*."

Over the last 50 years *Physical Review A, B, C, and D* have established an excellent reputation for quality and integrity continuing the tradition of the original *Physical Review*. As with other journals in the portfolio, they are well respected in the community because of their high quality peer review and professional, fast, and efficient editorial handling.

The editors and staff of the *Physical Review* journals are committed to continuing this tradition in the future. We will continue to publish enduring discoveries and tomorrow's advances in fulfillment of the mission of the APS: "To advance and diffuse the knowledge of physics for the benefit of humanity, promote physics, and serve the broader physics community."

Matthew Salter is APS Publisher and Michael Thoennessen is APS Editor in Chief.