

GOVERNMENT AFFAIRS

APS Sends Letter to Biden Transition Team Outlining Science Policy Priorities

BY TAWANDA W. JOHNSON

APS has sent a letter to President-elect Joe Biden's transition team, requesting that he consider policy recommendations across six issue areas while calling for his administration to "set a bold path to return the United States to its position of global leadership in science, technology, and innovation."

Authored in December by then-APS President Phil Bucksbaum, the letter urges Biden to consider recommendations in the following areas: COVID-19 stimulus support; international collaborations and research security; visas and immigration; domestic workforce; nuclear threat reduction; and climate change.

"Many of our recommendations align with plans you offered during the campaign and can be executed immediately, within your first 100 days in office, or as part of your initial budget request to Congress. Their implementation would dra-



matically improve the current state of America's scientific enterprise and put us on a trajectory to emerge from the pandemic prepared to both compete and cooperate with our global counterparts," wrote Bucksbaum.

Current APS President Jim Gates added, "These priorities will not only benefit the physics community, but they will, if implemented, lead to outcomes that could improve the lives of many Americans."

The recommendations, as stated in the letter, are as follows:

• **Stimulus Support for Scientific Community:** Provide supplemental funding of at least \$26 billion, as outlined in the Research Investment to Spark the Economy (RISE) Act, for the federal science agencies in any future COVID relief legislation.

• **International Collaborations & Research Security:** To help achieve an appropriate balance between national security and the research requirements of open science,

BIDEN LETTER CONTINUED ON PAGE 7

GOVERNANCE

New APS CEO: Jonathan Bagger

BY JONATHAN BAGGER

Editor's note: In December, incoming APS CEO Jonathan Bagger met with APS staff to introduce himself and answer questions. We asked him to prepare an edited version of his introductory remarks for the entire membership of APS.



Jonathan Bagger

It goes almost without saying that I am both excited and honored to be joining the American Physical Society as its next CEO. I look forward to building on the many accomplishments of my predecessor, Kate Kirby. But before I speak about APS, I should tell you a bit about myself.

I grew up in New Jersey, the oldest of four children, and the only one who went into science. My journey started in middle school with a terrific physical science course. We had great fun doing experiments almost every day, discovering our own laws of physics, with greater or lesser success. Every so often, the teacher, Matt Kashuba, stepped in and nudged us

back on track. It was a wonderful experience. (High school physics was another matter; the labs with water and ripple tanks were memorable for all the wrong reasons.)

I went to Dartmouth College in New Hampshire, where I had an amazing freshman year course taught by Bruce Pipes. Oh, did we struggle, but my friends from that experience remain friends

BAGGER CONTINUED ON PAGE 6

CAREERS

Careers 2021 Provides Up-to-Date Content for Job Seekers

BY LEAH POFFENBERGER

Last year, APS launched *Careers 2020*, the first APS Careers guide, featuring nearly 80 pages of articles, profiles, and other content aimed at students, early career physicists, and other job seekers. While some of the plans to distribute hard copies of the guide at in-person APS meetings were thwarted by COVID-19, the online edition garnered 85,000 views, supplying valuable career advice to APS members.

The next edition of the guide—*Careers 2021*—is ready to launch, with new, up-to-date content for today's job seekers. *Careers 2021* contains new articles on career paths in physics, APS career-related programs, and an employer directory of companies currently looking to hire physicists.

"We're really excited to be putting this guide out again," says Crystal Bailey, Head of Careers Programs at APS. "We're hoping to really push this out to the APS



community in 2021 and to get this into the hands of as many members as possible."

Like its predecessor, *Careers 2021* will be available online, and a hard copy will be mailed to every undergraduate member of APS, but there are plans in place to get more copies to attendees of APS meetings.

"The [National Mentoring Community] conference is going to do a physical mailing to every registered attendee and copies will be mailed out after the Conference

GUIDE CONTINUED ON PAGE 5

MEETINGS

Lessons Learned from a Successful Year Online

BY LEAH POFFENBERGER

Early in 2020, APS made the tough call to cancel its in-person meetings, shutting down two of its largest conferences. The APS Meetings Department has been able to quickly pivot to organizing conferences in the online world and lending support to APS membership units holding their annual meetings in 2020.

In November, three APS Divisions held their annual meetings online, testing new virtual meeting platforms, and recorded higher than average attendance numbers at each meeting. The Division of Nuclear Physics (DNP) attracted over 1300 attendees, more than their typical attendance of around 800. The Division of Plasma Physics (DPP) and the Division of Fluid Dynamics (DFD) drew 2200 and 3200 attendees respectively.

These highly successful meetings come at a time of rising costs to hold conferences online, especially for meetings with thousands of registrants signing on at the same time. DNP, DPP, and DFD were among the first online APS meetings to charge a registration fee—about half of the usual cost to register for an APS meeting for regular members with a larger discount for students.

"Running these conferences can cost a lot of money—there's a whole production element to putting on a virtual meeting," says Hunter Clemens, Director of

Meetings at APS. "Broadcasting a science conference can be a bit like TV, and you have to pay for technicians, a production manager and airtime...There is a lot of value to these meetings, but also a cost—but we're trying to make them as affordable as possible while still making them happen." On top of that, he adds, there are more than a million organizations that hold conferences and demand for virtual meetings has surged owing to the COVID-19 pandemic.

"Companies charge money to run these meetings, and especially for large meetings—you can't have a Zoom session with 10,000 people so we have to have a company that has a lot of servers and bandwidth," says Michael Brown, DPP Chair Elect and professor at Swarthmore College. "One thing these companies provide is that they record everything, and the talks are available for a year afterwards. Virtually everything that whole week was recorded. If you still have your registration, it's like the conference is still going on. That's a service that isn't free."

According to APS Chief Financial Officer Jane Hopkins Gould, APS-sponsored meetings are not a profit maker for the Society. "While it is our goal to cover all of the direct costs, most meetings do not produce sufficient revenue to cover the direct costs plus the internally allocated costs," she notes. "Advancing and diffusing

the knowledge of physics through APS meetings is a core mission activity and one in which APS and its members jointly invest both time and resources."

APS has also learned that most participants register just before a virtual event. "Unlike an in-person meeting which has fixed as well as variable costs that depend on attendance, a virtual meeting is primarily a fixed cost," explained Gould. "Regardless of whether 10 people or 10,000 people actually participate, APS has to work with its vendor far in advance to accommodate the estimated maximum number of participants to ensure a high-quality experience."

In 2020, APS tested a number of virtual platforms and a number of pricing structures. "The goal of APS meetings, whether in person or virtually, continues to be making them financially accessible to physicists from across the world while maintaining easy access to the highest quality content, whether live or asynchronous," said Gould.

In order to support and broadcast the elements of an online meeting, from live talks to poster sessions to virtual exhibit halls, both DPP and DFD opted to use Bravura Technologies to host their meetings. Bravura has partnered with APS before on the phone app for in-person March and April meetings. DNP opted to partner

ONLINE CONTINUED ON PAGE 7

EDUCATION

Physics REU Leadership Group Gathers Online for First Virtual Meeting

BY LEAH POFFENBERGER

The National Science Foundation's Research Experiences for Undergraduates (REUs) present important opportunities for undergraduate students to gain valuable research skills and complete projects that may not be possible at their home institutions. In order to keep REUs running this past summer when in-person programs were shut down, physics REU site leaders banded together to share resources and ideas for successful programs.

The NSF Physics REU Leadership Group (NPRLG) is an organization of REU site leaders, funded by NSF and partnering with APS to ensure the continued success of physics REUs. Last summer, APS was awarded a \$120,000 grant from NSF to support NPRLG with activities for ongoing REUs, as well as to fund an online workshop for REU leaders that was held November 12–14.

The 2020 Physics REU Workshop virtually brought together both current REU leadership and individuals interested in starting REUs at their own institutions for three days to discuss how to launch or improve their programs, how to assess program impact, and how to recruit diverse REU participants. APS was responsible for assisting with planning and logistics and running the technical pieces of the meeting to ensure a seamless online meeting experience.

Nearly 40 attendees joined the meeting, which is the first NPRLG meeting held since 2016. The first day of the meeting featured a session aimed at potential REU leaders or representatives from institutions interested in partnering with REUs in the future. NSF program officers were on hand to answer questions. The second day of the conference

included opportunities for REU site leaders to get to know one another and their programs, followed by a panel on supporting underrepresented minorities at REUs.

"A highlight of meeting was the panel discussion on support and recruitment of minority students, featuring three panelists: Arlene Modeste Knowles from the American Institute of Physics, who spoke about the AIP TEAM-Up report, Ramone Lopez (University of Texas at Arlington), and Alexander Rudolph (Cal Poly Pomona, Cal-Bridge)," says Brián Clash, Senior Coordinator in the APS Programs Department. "That session was particularly good because the various panelists provided a lot of sound advice and research-based guidance to attendees. Many attendees had questions about the best ways to attract the interest of minority students and how to be intentional about doing so—people were really engaged in that session."

The last day of the meeting focused on developing common assessment tools to benefit individual REU sites and the entire physics REU community.

"I like to think of the 50+ Physics REU sites across the US as hubs of opportunity for undergrads to advance their careers, with the NPRLG connecting these hubs into a network," says Daniel Serrano, NPRLG Chair. "The site directors' meetings allow us to shape and strengthen those connections by coming up with common values and goals, planning collaborative activities around them, and sharing ideas about how to make our programs better."

To learn more about NPRLG, visit aps.org/programs/education/undergrad/physicsreu/nprlg.cfm.



THIS MONTH IN

Physics History

January 1965: Roger Penrose's seminal proof of black holes

The eminent physicist Roger Penrose won the 2020 Nobel Prize in Physics "for the discovery that black hole formation is a robust prediction of the general theory of relativity," sharing the prize with Reinhard Genzel and Andrea Ghez, "for the discovery of a supermassive compact object at the center of our galaxy." But the rough concept of a black hole dates back to the 18th century, before Albert Einstein had even formulated his general theory of relativity and before Penrose's discovery in 1965.

British astronomer John Michell wrote a foundational paper in November 1783, later published in the Royal Society's journal, that was the first to speculate on the existence of black hole-like objects. His intent was to discover a useful method to determine the mass of a star. He thought he could measure how much the speed of light was reduced by passing light from a star through a prism; it ought to be deflected differently because of the reduced energy. He could conceivably compare the refracted images of different stars to determine the difference in their surface gravity, and from that, calculate their respective masses.

Michell understood the concept of escape velocity and that this critical speed would be determined by the mass and size of the star. He pondered what would happen if a star were so massive, and its gravity so strong, that the escape velocity was equivalent to the speed of light. He concluded:

"If the semi-diameter of a sphere of the same density as the Sun in the proportion of five hundred to one, and by supposing light to be attracted by the same force in proportion to its [mass] with other bodies, all light emitted from such a body would be made to return towards it, by its own proper gravity."

This would render that star invisible to astronomers. He thought there could be many such objects in the universe, undetectable because they emitted no light. Michell also speculated that the motion of binary star systems could help scientists indirectly detect these "dark stars."

Some 13 years later, French polymath Pierre Simon Laplace independently came to a similar conclusion. In his 1796 treatise, *Exposition du Systeme du Monde*, he specifically considered the case for a star four times the density of the Sun and provided an explicit mathematical formula for Michell's "dark star" hypothesis.

Over 100 years later, Albert Einstein developed his general theory of relativity, revolutionizing our understanding of spacetime and gravity, thereby opening up an entirely new realm of theoretical possibilities. Physicists began exploring those possibilities almost immediately, most notably Karl Schwarzschild, who was then



Roger Penrose

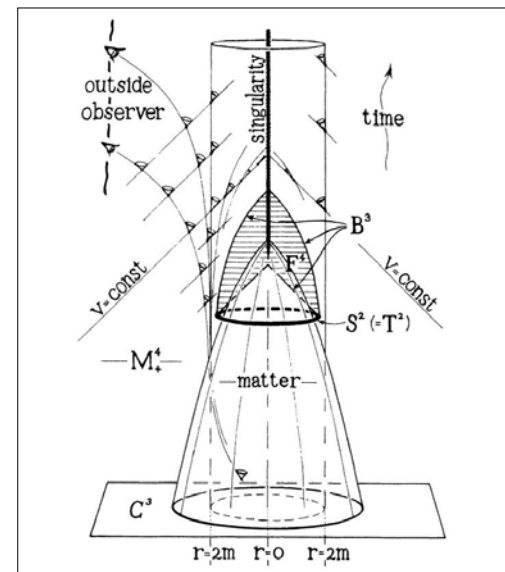


Diagram from Penrose's paper in *Physical Review Letters* showing the progression of matter (bottom) into a black hole singularity (heavy vertical line).

serving at the front during World War I. While sheltering from heavy gunfire, Schwarzschild found himself fiddling with different solutions to Einstein's field equations, eventually discovering a point where those equations "blew up." This work was an early mathematical description of what we now know as a black hole. (Robert Dicke is credited with coining the term in 1960, although it was John Wheeler who popularized it.)

For several decades afterwards, physicists largely considered black holes to be purely theoretical exotic objects, rather than something that might actually exist in the universe. Granted, in the 1930s, J. Robert Oppenheimer and Hartland Snyder mathematically demonstrated that a massive star could collapse to form a black hole. They concluded in a 1939 paper that the a black hole would close "itself off from any communication with a distant observer; only its

HISTORY CONTINUED ON PAGE 5

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CAREERS

APS IMPact Mentoring Program Helps Foster Connections Between Students and Industry

BY TAWANDA W. JOHNSON

The website for the APS IMPact Mentoring Program, the Society's resource for connecting young physicists with industry mentors, has been relaunched with a new look and better tools. According to Dan Pisano, Director of Industrial Engagement at APS, the refreshed site "appears to be fostering some useful mentoring of students and early-career physicists with industry representatives."

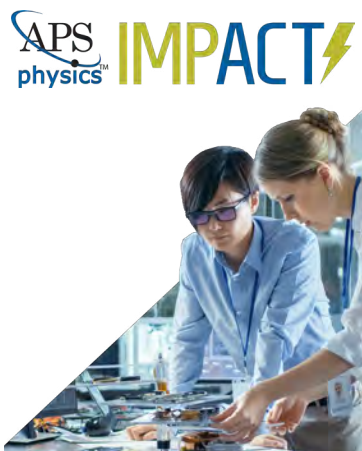
The goal of the IMPact Mentoring Program is to match students, post-docs, and early-career physicists with industry representatives to provide advice about careers in industry. The mentoring site started in 2015 and currently has generated about 300 active matches between mentors and mentees.

The upgraded site, which has been available for about two months, is now more user-friendly, featuring new graphics. Most importantly, the site's matching algorithm has been adapted to accommodate international members who wish to be mentors or mentees.

"This platform recognizes that we're all interconnected. We hope that students from all parts of the world will be able to connect with a mentor in any country in which they wish to work. Likewise, those mentors who may also be seeking to hire can tap into a global pool of young physics talent," said Amy Flatten, APS Director of International Affairs, in a recent APS News article about the topic (see APS News, December 2020).

APS members who want to become mentors can sign on to the site and complete a brief profile to help ensure that mentees will be introduced to the most appropriate mentors. Similarly, APS members who want to be matched to a mentor can register and complete a brief profile indicating the area in which they wish to receive advice. The site's matching algorithm then scans all available mentors and selects those who match the mentee's area of interest. The list of potential matches is presented to the mentee who can then reach out to make contact with one of the mentors.

Mentees can seek advice on a variety of career topics, and there is no minimum or maximum length of time a mentee and a mentor can interact with one another. The interaction is solely at the discretion of the two parties, but



APS recommends four interactions over 90 days. At the conclusion of their interactions or at 90 days (whichever comes first) a questionnaire is sent out to gauge the degree of satisfaction. The survey results after 90 days show that 96% of mentors would "certainly" do this again, and 87% of mentees would "certainly" recommend the program to a peer.

The program is part of APS's vision that "all graduating physicists consider APS their home professional society throughout their career," according to Francis Slakey, APS Chief External Affairs Officer.

"We know that more than 70% of graduating physicists secure employment within the industrial sector, and one way that APS can help to prepare them for business careers is by partnering them with experts in industry," said Pisano, adding that physics departments are often not in a position to focus on such skills due their primary emphasis on research.

To complement the goal of the IMPact program, Pisano has also teamed with Crystal Bailey, Head of Career Programs at APS, to develop a new webinar series highlighting key skills and knowledge young physicists need to succeed in industry.

"Industry employers already clearly value what physics graduates bring to their companies, but they have also pointed out that other key skills and knowledge could be stronger in new hires; this webinar series will help students build these skills," said Bailey in a recent APS News article (APS News, October 2020).

Visit the APS IMPact website (impact.aps.org) to learn more about the mentoring program.

The author is Senior Press Secretary in the APS Office of External Affairs.

MEMBERSHIP UNITS

The APS Division of Nuclear Physics

BY ABIGAIL DOVE

With over 2,600 members, the Division of Nuclear Physics (DNP) is a home for physicists who study how matter in the universe evolved, the current matter composition of the universe, and the properties of nuclei that exist in both chemical elements and stars.

"Nuclear physics topics can be viewed as five vibrant and interconnected subfields," according to DNP chair Krishna Kumar (UMass Amherst). Broadly, these include the structure of nuclei, nuclear astrophysics, the structure of protons and neutrons (so-called "cold quantum chromodynamics"), the study of quarks and gluons at high temperature (so-called "hot quantum chromodynamics"), and the study of the fundamental nuclear forces and their role in the evolution of the early universe.

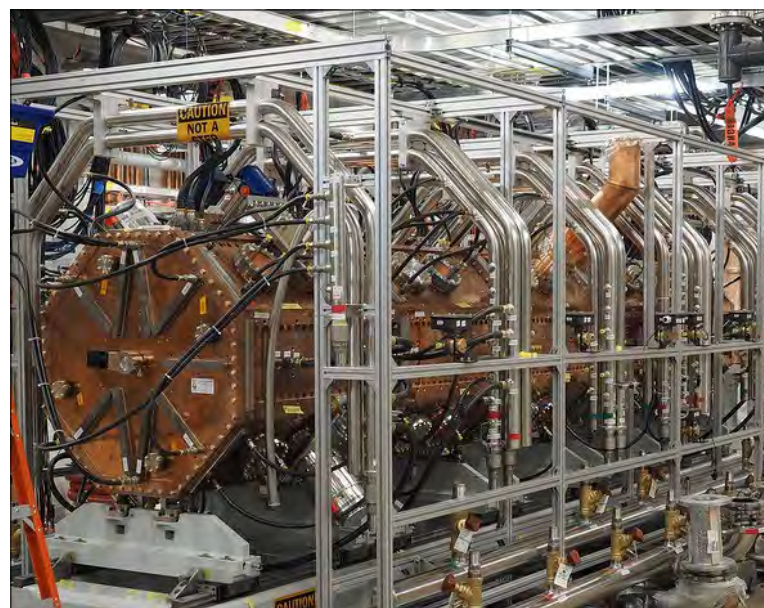
This is an especially busy time in the world of nuclear physics given the construction of two major new accelerator facilities: the Facility for Rare Isotope Beams (FRIB) at Michigan State University and the Electron-Ion Collider (EIC) at Brookhaven National Lab. Slated to start operations as soon as 2022, FRIB will provide intense beams of rare isotopes (that is, short-lived atomic nuclei not normally found on Earth) that will allow further study into nuclear structure, the origins of elements, and the forces that shaped the development of the universe in the moments after the Big Bang.

Groundbreaking for the construction of EIC—a 2.4-mile-circumference particle collider—occurred last September. This facility will be uniquely positioned to address important questions about nucleons (that is, neutrons and protons), including how mass and spin arise and the possible emergent properties of dense systems of gluons. "It is a very exciting time," noted DNP vice-chair Vickie Greene (Vanderbilt), "Things really come alive when these new machines come online."

A particular point of pride for DNP is its long-running, mid-October Annual Meeting. This meeting showcases the latest developments in all the subfields of nuclear physics, with an emphasis on new experimental results and notable theoretical developments. Besides a large selection of invited and contributed talks from across the spectrum of nuclear physics, the meeting also includes a selection of topical workshops, a popular Women in Science Social, a town hall meeting where DNP members can express their concerns and opinions, and multiple poster sessions.

Kumar explained that an important emphasis at this meeting is engaging DNP's newest members and providing a platform for undergraduates and graduate students to delve deeper into the field. Indeed, the DNP Annual Meeting is an important rite of passage for many nuclear physicists. "If you're a nuclear physicist in training, your first presentation will likely be at the Divisional Meeting," noted Greene. "This exposure is very important for young people."

Despite the change to a virtual format, DNP's 2020 Annual Meeting



Nuclear physicists will be busy in coming years as new instruments like the Facility for Rare Isotope Beams at Michigan State University (pictured) come online. IMAGE: FRIB/MSU

was a resounding success, drawing 1,400 people—nearly double its normal attendance on the order of 700 to 900. This was mainly driven by increased engagement from young scientists and scientists from abroad.

"This was our first fully online meeting, and our focus was on ensuring that the membership was able to get the same exposure to the state of research in a wide variety of topics as in an in-person meeting," explained Kumar. "The feedback from the membership has been very positive."

"From the perspective of internationalism, it was a huge success," added Greene. "I'm hoping that we can maintain a virtual component in future meetings to maintain the international participation. There is very good science being done all over the world, and we don't often have the opportunity to hear about this outside of big meetings."

DNP is also very active at the APS April Meeting, where it sponsors a mix of dedicated sessions on nuclear physics as well as joint sessions partnered with APS units such as the Divisions of Gravitational Physics (DGRAV), Astrophysics (DAP), and Particles and Fields (DPF)—encouraging cross-talk and collaboration among these closely related branches of physics.

Looking to the future, the DNP executive committee's goals are many. "Coming into a leadership role, my primary focus was to further cement what I see as DNP's greatest strength, which is to bring together broad swaths of researchers and applied physics practitioners who are interested in a deeper understanding of in the inner workings of the universe over the entire range of observable length scales—from subatomic to intergalactic," explained Kumar. Since the onset of the COVID-19 pandemic, this emphasis has extended to ensuring that DNP members are able to communicate and network with the same pace and intensity as before, despite pandemic-related restrictions.

Complementing this, Greene underscored the importance of promoting the participation of women and under-represented minorities in the nuclear physics community. "It's still the case in physics that participation on the part of women is only about 20%," she explained,

"And at the professor level it falls to about 8%." DNP in particular is composed of about 15% women, placing it among the top five APS divisions for gender diversity, but with room for growth.

An important action the division has taken to this end is the establishment of the DNP Allies Program, an intervention to ensure that conferences are as inclusive and as comfortable for people as possible and to reduce the impact harassment (whether intended or unintended) may have on the field of nuclear physics. The program trains "allies" from the nuclear physics community to help people who may feel harassed. Wearing bright orange scarves or armbands, allies are easily identifiable at the DNP Annual Meeting and are on alert for anyone who may be feeling uncomfortable and available to talk and provide guidance to meeting participants who have experienced harassment. "There is still so much work to do around representation," noted Greene, "Especially for a younger person in nuclear physics, it doesn't take many negative comments before they can get discouraged about the field as a whole."

Greene also highlighted increased public outreach about the exciting advances in nuclear physics as a goal for DNP. "Taxpayers are funding much of this research, and they should get some fun out of it," she pointed out.

Overall, with a well-deserved reputation, DNP stands out as a cornerstone of research and innovation at APS. "Science isn't something that happens in a vacuum," Greene explained. "It takes place in the context of a community, and DNP represents that community." According to Kumar, "Any APS member who has a keen interest in the physical universe and the problems, challenges and techniques that are employed and further developed to advance our fundamental understanding of its fundamental constituents, evolution and observed properties would profit from engagement within our vibrant membership."

More information on this unit can be found on the DNP website.

The author is a freelance writer in Stockholm, Sweden

APS
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GOVERNMENT AFFAIRS

Together, APS OGA and Society Members Set Record for Actions in 2020

BY TAWANDA W. JOHNSON

The APS Office of Government Affairs (APS OGA) set a record in 2020 by facilitating more than 18,000 contacts from APS members to federal policy-makers and their staff. Members helped advance the Society's science policy priorities through op-ed placements, emails to Congress, public comments, social media posts, phone calls, and visits to DC and district congressional offices.

"I'm extremely proud of the dedication this year from both APS members and our staff. Working together, we saw a record number of actions by APS members, advocating for physics and amplifying their voices for science. The number of contacts made to congressional and executive branch officials is more than seven times our total in 2019," said Mark Elsesser, Interim Director of APS OGA.

Advocating During Congressional Visits Day 2020

In January 2020, the office kicked off the new year with APS's annual Congressional Visits Day, when nearly 70 APS members advocated for the Society's science policy priorities on Capitol Hill. Representing 26 states across the country, groups of these volunteers participated in nearly 100 meetings to make the case for science policy priorities determined by APS members and leadership. During the meetings, APS volunteers requested that members of Congress: support the Combating Sexual Harassment in Science Act; cosponsor the Keep STEM Talent Act; preserve methane emissions regulations on the oil and gas industry; introduce legislation to keep the Federal Helium Reserve open and create a robust helium recycling program; and include funding increases of at least 4 percent real growth for key science agencies during the fiscal year 2021 appropriations process.

Responding to the COVID-19 Pandemic

After the COVID-19 pandemic hit in March, APS's immediate top priority was ensuring that graduate students and postdocs could continue to be financially supported via federal grants during the health crisis. Following a grassroots campaign and direct lobbying by the Society, federal agencies agreed to allow students and postdocs to be supported from current grants.

As part of the Society's ongoing response to the health crisis, 2020 APS President Phil Bucksbaum sent a letter to the House Science Committee outlining policy initiatives that would help the physics community overcome challenges posed by the pandemic, which has impacted APS members in myriad ways, including a severe reduction of research activity at many of the nation's laboratories and universities.

"I want APS members to know that the Society is working hard to help get our physics community through and beyond this pandemic," said Bucksbaum after he wrote the letter. He asked Congress to take the several steps to help restore research after labs reopen, including:

- Provide ramp-up funding to restart labs; and
- Enhance domestic STEM scholarships.

Nearly 1,000 APS members participated in a grassroots campaign to encourage their legislators to follow the recommendations laid out in Bucksbaum's letter.

Legislation quickly emerged in Congress that advanced the recommendations. The Research Investment to Spark the Economy (RISE) Act, called for the authorization of approximately \$26 billion in research relief funding to the federal science agencies, enabling them "to extend grant funding awarded prior to the COVID-19 pandemic, support training extensions for graduate students and postdoctoral researchers to alleviate the disruption to the R&D job market, and enable the refurbishment or replacement of equipment damaged because of the COVID-19 disruption."

Through multiple campaigns across three months, including one in conjunction with 22 other scientific societies, APS members connected with legislators through phone calls, emails, and social media more than 3,000 times, leading to the bill being passed out of committee in the Senate and generating more than 140 co-sponsors in the House.

Pushing Back Against Trump Executive Actions

Last year was also marked by many White House executive actions that harmed international students who are essential to the physics community and vital to the US scientific enterprise. On July 6, for example, the US Immigration and Customs Enforcement (ICE) division of the Department of Homeland Security announced a rule change that would have forced international students currently in the US to return to their home countries or switch to an institution offering in-person instruction if their current institution had offered only online courses last fall.

Harvard and MIT filed suit against the rule, and APS rapidly developed an amicus brief to support their case. Sixteen scientific organizations, including the American Association for the Advancement of Science and the Optical Society, joined the APS brief in the Amicus Brief. Caving to this widespread opposition, ICE rescinded the July 6 directive.

"The government capitulated entirely," said 2020 APS President Phil Bucksbaum following ICE's decision. Before ICE's decision to rescind the order, 260 legislators were contacted by APS members..

"These actions show the importance of an organization reacting quickly, and they also show that the science community can truly make a difference," said Bucksbaum following the good news.

APS faced another challenge after hearing reports that the Optional Practical Training (OPT) program might be curtailed or even eliminated. OPT enables highly skilled international students who completed their studies in the US to gain work experience for a period of time and is used as a recruiting

- Provide partial- and full-grant cost extensions;



Nearly 70 APS members participated in the 2020 Congressional Visits Day to Capitol Hill to advocate for the Society's science policy priorities.

tool by high-tech companies. With support from APS's Office of International Affairs and Office of Industrial Engagement, APS OGA developed a plan to stimulate House Republicans to publicly defend OPT.

Francis Slakey, APS Chief External Affairs Officer, worked with the office of US Rep. Steve Stivers (R-15th-OH) on a letter defending OPT, which could then be signed by additional Republicans and sent to the Trump Administration. APS members were asked to contact their congressional representatives during the weekend to meet a tight deadline impacting a potential executive order. And they rose to the occasion.

"I'm delighted that more than 500 APS members, all constituents of key House Republicans, took action that weekend, making phone calls and sending personal emails," Slakey said following the campaign.

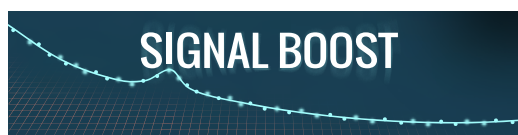
"As a result, 12 Republicans contacted by APS members agreed to sign the letter from Stivers, tilting the issue in our favor," said Slakey following the campaign. Mike Mayo, an APS member and tech firm owner in Austin, also played a role in the OPT campaign by writing an op-ed that appeared in the Austin Business Journal. APS OGA led another grassroots campaign on the matter.

To prevent further attacks on OPT, APS OGA developed a new report process that is designed to yield brief policy reports on a short timeline (fewer than six months). The initial report, titled "How International Students and Researchers Benefit the United States: Their Experiences, Their Stories," is centered on a collection of personal stories from APS members highlighting the importance of OPT and J-1 visa programs. APS OGA will use the new report

process as a means to quickly deliver timely information to Congress and the Administration.

APS faced yet another obstacle after the Department of Homeland Security (DHS) proposed a rule change to eliminate the current "duration of status" guidelines that allow international students who study in the US on certain visas—such as F and J visas—to remain in the country for as long as they maintain compliance with their terms of admission. The proposed rule change would have replaced the duration of status term limit with an arbitrary and restrictive two- and four-year limit, depending on one's country of origin. In response, APS mounted a campaign to collect and submit as many unique comments as possible to DHS with a goal to

ADVOCACY 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

US Arrests of Scientists Roil Research Community

BY MITCH AMBROSE

One year ago this month, Harvard University Chemistry Department Chair Charles Lieber was arrested for falsely denying to federal investigators that he had participated in a talent recruitment program supported by the Chinese government. The Department of Justice (DOJ) later added charges of filing false tax returns, alleging Lieber failed to report income received from the Wuhan University of Technology, which recruited him to establish a research lab.

The case marked an escalation in DOJ's "China Initiative," which it launched in November 2018 to increase resources devoted to prosecuting cases involving the misappropriation of US-funded research, among other matters. To date, the department has charged more than 25 researchers through the initiative, of which the majority are university professors or visiting academics. Many of the cases are still pending, including that of Lieber, who has pled not guilty.

Though DOJ has prosecuted several industry researchers for trade secret theft, the cases involving university-based scientists largely hinge on a variety of fraud charges, such as failing to disclose funds received from China. In concert with DOJ, over the past two years grantmaking agencies such as the National Institutes of Health (NIH) and National Science Foundation (NSF) have ramped up investigations of researchers suspected of failing to disclose foreign sources of grant support or other foreign ties.

In June 2020, NIH reported it had contacted institutions with concerns about 189 scientists, of which 175 had some form of undisclosed connection to China, such as significant employment contracts with Chinese universities. It also revealed that 54 of the scientists resigned or were fired as a result of the investigations. NSF subsequently disclosed that based on similar investigations it had taken administrative actions against 25



researchers, such as suspending or terminating their grants.

The scale of the firings and enforcement actions has unsettled many in the research community, with some advocacy groups arguing the government is unfairly targeting scientists with connections to China and harshly punishing what amount to administrative violations. Meanwhile, federal officials maintain they are rooting out serious violations of agency policies and research norms concerning transparency and reciprocity in international collaborations.

Another escalation in the China Initiative came when five visiting

ARRESTS CONTINUED ON PAGE 6

JOURNAL PUBLISHING

APS Joins Other Global Physics Societies in Open Access Statement

BY DAVID VOSS

APS has joined 15 other international physics organizations in a call for universal access to knowledge and a commitment to sustainable open access. The statement, titled "Achieving Open Access in Physics," reaffirms the innovative ways that the physics community has long supported open access (OA) through its preprint server (arXiv.org) and fully OA journals.

The physics societies caution, however, that some government mandates such as requirements proposed by cOAlition S—a group of EU funding bodies—would harm the freedom of researchers to choose the most appropriate venues for publication and would undermine viability of physics publishing that depends on high-quality peer review.

APS has long been at the forefront of open access, having launched its first OA journal, *Physical Review Accelerators and Beams* (PRAB) as long ago as 1998. Its current portfolio includes five fully OA journals: *Physical Review X*, *Physical Review Research*, *PRX Quantum*, *Physical Review Accelerators and Beams*, and *Physical Review Physics Education Research*. In addition, in early 2011 APS transformed some of the largest, most-cited, and most-trusted peer-reviewed, primary research titles in physics into hybrid journals by offering authors an option to publish individual articles open access. The joint statement notes that more than 85% of physics papers are published in



hybrid journals, but that cOAlition S would forbid researchers who obtain funding from their member organizations from publishing in hybrid journals, including those in the Physical Review family.

The statement also points out that a shift from the reader-pays subscription model to a researcher-pays OA system will require a substantial realignment of funding structures. "Broader global financial support for OA will need to be in place before most hybrid physics journals can viably transition," the statement says. "Adjustments to the global flow of funding will take time."

The signatory group comprises 16 societies: The Acoustical Society of America, The American Association of Physicists in Medicine, The American Association of Physics Teachers, The American Astronomical Society, The American Crystallographic Association, The

American Institute of Aeronautics and Astronautics, The American Institute of Physics, The American Physical Society, AVS Science & Technology of Materials Interfaces and Processes, The Chinese Physical Society, The European Physical Society, The Institute of Physics, The Institute of Physics and Engineering in Medicine, The Laser Institute of America, The Optical Society, and The Society of Rheology.

In emphasizing the joint commitment, the statement concludes that "Physicists will continue to innovate in OA and open science, and physics societies endorse any and all OA models that can provide financially sustainable support for author choice and the quality of peer review and publication upon which excellent physics research relies."

The text of the statement is available at go.aps.org/2Wz5bdP.

HISTORY CONTINUED FROM PAGE 2

gravitational field persists," they concluded in a 1939 paper.

But most of the solutions assumed idealized perfectly symmetrical stars and black holes. The actual universe is much messier. The discovery of quasars in 1963 shifted the conversation substantially, as physicists came to realize that the likeliest source of radiation from the brightest known objects in the universe was matter falling into a massive black hole.

Enter Penrose, who was drawn to the challenge of figuring out a realistic mechanism by which black holes might form. Penrose opted for what was then a rather radical approach: he ignored the detailed geometrical structure of space time and focused his attention on the topology of space.

His breakthrough insight occurred during a walk through London. Penrose imagined what he called a "trapped surface": a closed, two-dimensional surface that directed all light rays to an infinitely dense center. This describes what we now call the black hole's singularity. He also used his eponymous Penrose diagrams (among other tools) to show that once such a trapped surface had formed, under general relativity, the collapse toward the singularity is inevitable. The result was a January

1965 paper in *Physical Review Letters* entitled "Gravitational Collapse and Space-Time Singularities."

Four years later, Penrose came up with his "weak cosmic censorship" conjecture, followed by his "strong cosmic censorship" hypothesis in 1979, which is still widely regarded as one of the most significant unresolved challenges in theoretical physics. The gist: a black hole's singularity could not be "naked"; it had to be confined and forever hidden behind the veil of the event horizon. There would, however, be a visible, strongly curved (though finite) exterior region.

Penrose even figured out a complicated process (now called the Penrose process) by which some of a rotating black hole's gravitational energy might be extracted. Specifically, spacetime is dragged along with the black hole's rotation, producing a dramatic effect because of the strong gravitational forces involved. There is an "ergosphere" just outside the event horizon, and any observer within it will be carried along with the rotation too.

Penrose imagined shooting a projectile into the ergosphere, splitting it in half. One half falls into the black hole, and the other escapes. This process could produce an escaping half with a greater total energy than the original projectile,

which could then be extracted from the black hole. Roger Blandford and Roman Znajek later used this insight to build their own realistic model of how to generate power with a rotating black hole.

No longer merely exotic objects existing primarily in theory, black holes continue to fascinate physicists and spur both theoretical and experimental breakthroughs. As recognized by the Nobel committee, Genzel and Ghez discovered the existence of a supermassive black hole at the center of our galaxy, helping to bring black holes to life outside of theory.

Further Reading:

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Penrose, Roger. (1965) "Gravitational Collapse and Space-Time Singularities," *Physical Review Letters* 14(3): 57-59.

Thorne, Kip and Hawking, Stephen. *Black Holes and Time Warps: Einstein's Outrageous Legacy*. New York: W.W. Norton, 1994.

Schirber, M. (2020) "Nobel Prize: Facing the Reality of Black Holes," *Physics* 13, 158.

GUIDE CONTINUED FROM PAGE 1

for Undergraduate Women in Physics (CUWiP) as a tangible benefit for those new student members," says Bailey. "We're hoping if there are in-person meetings in the fall that we will be able to take copies to meetings, but if not, we're going to work with organizers to make sure copies are accessible to attendees."

While the main audience for *Careers 2021* is students and early career physicists, the wealth of content contained in the guide is potentially useful for any APS member. Those new to career exploration can broaden their perspectives on what kinds of jobs are available with Career Pathways articles. Active job seekers can also benefit from advice on career development as well as the employer directory of companies that are actively recruiting.

"*Careers 2021* is also beneficial to faculty, or anyone who is in a position to be mentoring students," says Bailey. "There is a wide variety of career paths beyond academia and career mentors might struggle with knowing what those careers are—and this guide can help."

Careers 2021 is the result of the second year of a partnership between APS and the Institute of Physics Publishing (IOPP) to provide high-quality career resources to APS members. Last year's guide, despite some setbacks in distribution due to COVID, received great reviews from those who received it, especially from students at the CUWiP and those involved with the APS Student Ambassador program.

"Not only does the guide provide insight into the possible paths you can take after you get your degree in physics, but it showcases employers who are in need [of] and appreciate people with a background in physics. This is the best part of the career guide for me," said Jorge Garcia, an APS Student Ambassador and a graduate student at New Mexico State University, about *Careers 2020*. "It gives you the names of companies, what kind of work they do, and what degrees they look for in an employee. This gives a lot of insight into where your background is needed and helps focus your efforts in positions and companies that are a match for you."

The employer directory included in *Careers 2021* promises to be just as useful, since it isn't a re-print of last year's list, but a brand-new list of companies who are currently hiring.

"To get the most out of this guide, read it thoroughly, and to as much of an extent as possible, try to get in touch with these companies who put themselves in the directory—they really are interested in hiring," says Bailey. "These are companies that chose to participate during COVID—they're hiring now...consider using LinkedIn to find contacts to do informational interviews and really learn about what the company is doing."

APS Career Guides and other resources and advice for job seekers are available at aps.org/careers/.

ARRESTS CONTINUED FROM PAGE 4

Chinese researchers were arrested over the summer on charges of lying about their affiliations with the Chinese military on visa applications. The head of DOJ's National Security Division, John Demers, asserted at an event last month that more than 1,000 Chinese researchers affiliated with the Chinese military subsequently left the US, purportedly prompted by the arrests and an associated closure of the Chinese consulate in Houston.

Demers dismissed accusations that the government is engaging in racial profiling, remarking, "We're very careful about the way we talk about this problem because we don't want it to become about the Chinese people." He added, "You'll see a great mix of defendants when it comes to ethnic backgrounds; we are very much focused on behavior."

Pushing back on criticism that DOJ has leaned heavily on fraud charges rather than make more serious allegations of criminal conduct, Demers remarked, "Are those administrative violations?"

I don't know. I mean, those go to the core of integrity at an academic institution. And an academic institution is all about disclosing sources of funding so that people who are reading your research can figure out how to read that research. And that's true regardless whether your funding is coming from the alcohol and beverage industry or whether your funding is coming from the Chinese government."

He continued, "The focus is on disclosure, and our cases there reflect a desire to tailor our approach to the values of those institutions, which are transparency and academic integrity."

The author is Director of FYI.

Published by the American Institute of Physics since 1989, FYI is a trusted source of science policy news that is read by congressional staff, federal agency heads, and leading figures in the scientific community. Sign up for free FYI emails at aip.org/fyi.

BAGGER CONTINUED FROM PAGE 1

to this day. (One alumna of that course, Frances Hellman, is now APS President-Elect.) For me, that experience sealed the deal, and in due time I went off to graduate school at Cambridge and Princeton, where I studied theoretical physics. I then took positions on the West and East Coast, eventually landing at Johns Hopkins University in Baltimore.

I spent twenty-five years on the faculty at Johns Hopkins. I lived in Baltimore City and raised my family there. I grew to love the city and the community. I also grew to love Johns Hopkins. It was a wonderful place to grow, especially as over the years I came to know and appreciate the dedication of its medical faculty. Their sense of mission had a profound effect on me and on my career.

Seven years ago, I was approached to lead TRIUMF, Canada's particle accelerator center in Vancouver. The lab had its origins in nuclear and particle physics, but over the years its mission had grown to include materials science, nuclear medicine, and even commercialization. To me, TRIUMF epitomizes physics in action—crossing boundaries to make a difference in the lives of real people.

At TRIUMF, physicists work with chemists, biologists, and physicians—and with engineers, technicians and tradespeople. All come together as one multidisciplinary community. That's the magic of TRIUMF. I am honored to have served as its Director, and there is no question that I will miss it. But now it's time for me to return to the United States, to Maryland, and to my home in Baltimore.

I have a long history with APS. Over the years, I've served on the editorial boards of *Physical Review Letters* and *Physical Review D*, and as chair of the Division of Particles and Fields, a member of the APS Council and Board, a member and chair of various APS committees, and most recently as chair of the APS Task Force on International Engagement.

I am excited by all that is happening at APS. The Society has made great progress in building a modern and responsive organization. I am pleased that so many staff and volunteers have contributed to its success.

Looking forward, I see an organization with great potential, but I also see one facing significant challenges across many fronts.

- Journal publishing is vitally important to APS, but it is facing enormous challenges globally, not just at APS. The publishing landscape is changing quickly, and we have to change with it.
- The pandemic has upended the model for scientific meetings, but it has also opened new possibilities. What is the best way for our community to gather in this new era?
- Programs and membership must evolve to serve a new generation of APS members, many of whom have different expectations from their elders.
- Government affairs needs to speak loud and clear about the value of science and of international collaboration in a world where both have become suspect.

There are challenges and opportunities along each of these dimensions. Together with our members and their elected leaders, we will have to examine each of them. They are all important pillars of the Society. How can we do better? Myself, I think they reinforce each other in critical ways.

My vision for physics more generally is both broad and inclusive. When I was being trained in physics, we placed high walls around ourselves. If something was too complicated, we'd say, "oh, that's chemistry," or if it was a little too messy, we'd say, "oh, that's biology." But that attitude is a luxury we can no longer afford.

Today, across the globe, society is facing existential issues in many areas, including climate, energy, infectious disease, and food security. Progress will require multidisciplinary, multigenerational, fact-based solutions. Physics, with its collaborative culture and analytic approach, has much to offer. And frankly, if we don't step up, our field will become irrelevant.

Addressing these issues will require cooperation and collaboration, with many people engaged, each bringing their own talents and perspectives. We will need all hands on deck—no matter their race or gender or ethnicity or sexual orientation or national origin—no matter whether they're academic or industrial or international. Together, we need to build a welcoming and inclusive physics community.

And how can we do that? Part of the solution, I am convinced, lies in changing our culture. It seems to me that our physics culture is one of the barriers to inclusiveness. We need to challenge our assumptions and to eradicate inappropriate and unacceptable behavior.

I was delighted to receive the AIP TEAM-UP report, which addresses many of our cultural issues head-on. Through my role at AAAS, where I was Chair of the Physics Section, I made sure that the report was featured at the recent AAAS Annual Meeting in Seattle.

More recently, I was pleased to hear about the APS Inclusion, Diversity, and Equity Alliance (APS-IDEA) program. I encouraged TRIUMF to join because APS-IDEA offers an opportunity for Canadians to learn from their American colleagues, and likewise, for Americans to learn from the Canadian experience. Thank you for including our lab!

I am also pleased to support the APS Delta-Phy (Change Physics) program, which under the lead-

ership of APS President Jim Gates, offers additional hope for changing the culture within our field. We need to look at ourselves in the mirror—our culture and our values—because in the end, addressing our shortcomings will open our doors and make physics better for everyone.

Since I'm coming to APS from TRIUMF, I'd like to share our laboratory's values with you. About four years ago, we embarked on a year-long process of community consultation, the end result of which was a set of values to live by. I think they might even apply more generally:

Excellence and Integrity: We have a passion for excellence in all that we do. We are decisive, bold, courageous and compassionate. We take responsibility for our actions, our commitments, and our contributions to the larger community.

Safety and Accountability: We respect the health and safety of our workers, our visitors, and our neighbors. We build quality into our processes and seek continual improvement in all of our systems. We embrace transparency and authenticity and hold ourselves and each other accountable.

Equity and Inclusion: We empower our workforce and foster an inclusive work environment, enriching our science and our community. We value teamwork and open communication to ensure that everyone belongs, and all voices are heard. We respect each other, take care of each other, and support the success of all.

During the pandemic, our values proved helpful as we navigated the uncertainty together. We used them to guide our actions and to hold each other accountable. This past summer, they provided a framework for difficult lab-wide discussions about racism and its manifestations in Canada and abroad.

I am so proud that TRIUMF's values came from our community, and that equity and inclusion were held to be as important as safety and accountability—quite a statement from the employees of a licensed nuclear facility.

APS has values too, and those values must guide interactions between our members and our staff, our members with each other, and also our behavior as representatives of our community. Together, we can build a welcoming and inclusive physics community.

See also the interview with Jonathan Bagger in *Physics Today Online* (physicstoday.org/Dec2020b).

Call for Nominations APS Historic Sites

Propose sites that you feel should be officially recognized for their historical significance to physics.

Deadline: January 31, 2021

go.aps.org/historic-sites

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Rutgers, The State University of New Jersey (7)

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quarks 2020 cosmos

APRIL 17-20 ONLINE

Register Now

The APS April Meeting encapsulates the full range of physical scales including astrophysics, particle physics, nuclear physics, and gravitation. This year's Quarks to Cosmos (Q2C) theme is "Advancing Science in a Global and Inclusive Community."

Discounted Registration Deadline: February 26, 2021

BIDEN LETTER CONTINUED FROM PAGE 1

Presidential Directive NSDD-189 should be reaffirmed. The directive states that fundamental research is defined as research that is meant to be published in the open literature and that the products of fundamental research should remain unrestricted “to the maximum extent possible.” Classification should be used if control of particular fundamental research is required for national security.

• **Visas and Immigration:** The following actions should be taken to help return the United States to a destination of choice for international students and scholars and ensure that employers are able to recruit and hire talented individuals from around the world:

1. Immediately place a moratorium on the proposed rule “Establishing a Fixed Time Period of Admission and an Extension of Stay Procedure for Nonimmigrant Academic Students, Exchange Visitors, and Representatives of Foreign Information Media,” which is currently under development.
2. Immediately reverse the interim final rule referenced as DOL Docket No. ETA-2020-0006, implemented by the previous administration, which is designed to inflate the salaries of H-1B visa holders and employment-based immigrants to the extent that their services are priced out of the US labor market.
3. Work to reverse the deleterious effects on the R&D workforce of Presidential Proclamation 10052 put forward by the previous administration.
4. Support and implement policies that allow international students applying for an F-1 visa to indicate they would like to stay in the United States after graduation and provide them a clear path to a green card should they choose to stay and work here.

• **Domestic Workforce:** The following actions should be taken to help create a STEM workforce that more closely reflects the diversity of our nation:

1. Immediately rescind Executive Order 13950 put forward by

the previous administration and replace it with effective programs of training and education on diversity and inclusion.

2. Develop incentives for our top research universities to create meaningful lasting partnerships that strengthen the research capacity at emerging research institutions, including minority-serving institutions (MSIs), tribal colleges and universities (TCUs), historically black colleges and universities (HBCUs), and the colleges and universities with smaller research activities, which are often in underserved states.
3. Encourage the federal science agencies to adjust grant application requirements as appropriate to account for the current pandemic’s disproportionate impact on female principal investigators.

• **Nuclear Threat Reduction:** The following practical steps should be taken to reduce the nuclear threat:

1. Sign a five-year extension of the New Strategic Arms Reduction Treaty (New START). Without this extension, the treaty will expire on February 5, 2021, leaving the United States and Russia without any nuclear arms limitations treaty or agreement in place for the first time in nearly fifty years. A decision by the presidents of the United States and Russia to extend New START would provide additional time and a stable foundation for further potential negotiations with Russia and potentially with China on new and more ambitious arms control arrangements. It also would contribute to the fulfillment of their disarmament obligations and commitments under Article VI of the Treaty on the Nonproliferation of Nuclear Weapons (NPT).
2. Suspend all plans enacted by the previous Administration to prepare and proceed with a nuclear weapons test. The United States’ Stockpile Stewardship Program has “allowed DOE and DOD to certify the safety, security,

and effectiveness of the U.S. nuclear weapons stockpile to the President without the use of nuclear explosive testing” for the last 23 years, according to the National Nuclear Security Administration’s FY 2020 Stockpile Stewardship and Management Plan.

3. Strengthen US leadership in multinational efforts to curb global proliferation of nuclear weapons.

• **Climate Change:** The following actions should be taken to reduce the emissions, and ultimately the concentration, of greenhouse gases:

1. Include robust investments for basic scientific research across the appropriate federal science agencies as a central component to your plans to address climate change.
2. Reverse the previous administration’s final rule published on September 14, 2020 titled “Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review” and return to the methane regulations established under the Obama Administration. Additionally, your administration should begin a process to accurately assess methane emissions as a means to curb emissions of this potent greenhouse gas. This should be undertaken as part of a national policy to achieve or exceed the target set by the Paris Climate Agreement of emissions reduction of 26 to 28 percent below our 2005 levels by 2025.

Mark Elsesser, Interim Director of the APS Office of Government Affairs, said the Society is eager to work with the Biden Administration to bring these recommendations to fruition.

“APS has a long history of serving as a credible and reliable resource for policymakers in the White House and across the executive branch agencies. The Society will continue that trend under the Biden Administration and others to come,” he said.

The full text of the letter is available at go.aps.org/3rcENoc.

ONLINE CONTINUED FROM PAGE 1

with Michigan State University to use existing online meeting infrastructure built by the university. With the help of Bravura, the DPP and DFD meetings were able to take lessons learned from the virtual 2020 April Meeting and DAMOP to make even better, more user-friendly meeting experiences.

“Every time we hold a meeting, we learn a little more...we’ve added to [each meeting] every time,” says Clemens. “For example, during the 2020 April meeting, we didn’t have a method of communicating during the poster session. At DAMOP, we added a text chat, and for these meetings, we asked for a video chat for the poster session... What we’re trying to do at the 2021 March Meeting is to make it even better.”

Since many APS meeting attendees often rate the networking opportunities among the most valuable components of in-person meetings, online meeting organizers are working on new ways to help attendees make connections. Dedicated networking sessions via Zoom were popular at DFD, and new opportunities will be available at the 2021 March Meeting to better emulate the types of in-person interactions that are common while milling about a convention center.

“Two things we’ll be doing for March are: Having something called ‘hall networking’—right after a session, people usually go into the hall and continue to talk—people will come out of a talk’s Zoom room into their own networking room for 10 to 15 minutes to talk about the session,” says Clemens. “The other thing we’re going to do is create a networking room for each unit so they can go in and chat, along with some cross-topic networking rooms.”

While online meetings still have some limitations, Brown pointed out some ways that the virtual DPP meeting actually benefited from its format. One informal Q&A session brought together leaders

in plasma physics that likely wouldn’t have been able to attend an in-person meeting. Brown also notes the increased accessibility of meetings for international attendees and others who might not typically be able to travel. At future DPP meetings, Brown hopes to bring some virtual components to in-person sessions to provide more accessibility for DPP members who can’t travel to the conference.

The virtual DFD meeting also could have applications to an in-person meeting: Rather than attempting to run the usual 40 sessions simultaneously, presenters were invited to upload whatever supplemental content they wished alongside their abstracts. Viewers then accessed the additional content—ranging from minute long flash talks to in-depth 15-minute presentations—on their own time throughout the meeting. Ongoing chat boxes for each session facilitated a back-and-forth between the speaker and viewers.

“People could navigate through the abstracts, browse content or go deep with talks they really wanted to know more about. That went really well, and we had almost as many abstracts as usual,” says Jonathan Freund, DFD Meeting Chair and professor at University of Illinois at Urbana-Champaign. “There’s been talk of putting this—abstracts plus extra materials—in conjunction with in-person meetings.”

Looking ahead to the 2021 March Meeting, the APS Meetings Department has organized or provided support for 14 online meetings over the past year, and they hope to continue applying lessons learned to the largest APS meeting.

“Each meeting we have new iterations,” says Clemens. “The events we offer like poster sessions and networking are getting better each time—we just have to keep sharpening up.”

ADVOCACY CONTINUED FROM PAGE 4

delay the proposed rule’s implementation. The campaign yielded almost 1,600 comments. APS also sent a comment representing the entire Society.

APS wasn’t the only organization to mobilize on this issue. Tens of thousands of comments were sent to DHS — but, in a significant show of concern, nearly one in every 20 came from an APS member.

Making the Case for Helium

Helium continued to be an important advocacy issue for APS OGA last year. For the past several years, academic researchers have experienced unsustainable price increases and unreliable delivery of liquid helium. According to an APS survey of helium users nationwide, the average price of liquid helium increased by nearly 25% from 2018 to 2019; some researchers’ prices tripled during that time.

To deal with this crisis, leaders from four APS Units - DCMP, DMP, DAMOP and DQI - worked with APS OGA to urge Congress to ensure that federal users, including researchers supported by federal grants, maintain access to the helium marked for federal use remaining in the Federal Helium Reserve after September 30, 2022—the date by which the General Services Administration will complete its disposal process.

Elsesser and APS member Joseph DiVerdi, a chemistry professor at Colorado State University, gained ground toward the helium goal after an in-district meeting with US Rep. Joe Neguse (D-CO-2nd). Following the meeting, Neguse indicated that he would take the lead on legislation that would require the in-kind helium program to continue under any company that purchases the Federal Helium Reserve. DiVerdi


also made the case for helium in a widely circulated New York Times op-ed.

Becoming More Efficient and Effective in Advocacy


Also last year, APS OGA began using a software platform called Phone2Action to provide APS members a more user-friendly way to impact change in science policy.

“I want to thank APS volunteers for their extraordinary dedication in partnering with APS OGA last year. We know that many of them are busy teaching classes, conducting research, or even finishing PhDs, and APS OGA wanted to ensure our advocacy software is as accessible and user-friendly as possible,” said Callie Pruett, Senior Strategist for Grassroots Advocacy.

The author is Senior Press Secretary in the APS Office of External Affairs.



BRIDGE PROGRAM



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THE BACK PAGE

Language Matters—Writing Effective Letters of Reference

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Many of us have been working diligently over the last few years to make the demographics of physics more reflective of the general population. These longstanding efforts by many in our community became even more critical after the events of Summer 2020. In particular, the physics community has worked on making our culture more welcoming and our pedagogy more inclusive. We have started to work on initiatives designed to identify, recruit, retain, and promote members of marginalized groups, including programs such as the APS Inclusion Diversity and Equity Alliance (IDEA).

Inequality in the representation of ethnic, gender, and racial diversity at all levels in physics is due to several disadvantages marginalized groups face. While institutional changes are necessary, people in physics also depend on effective and compelling letters of recommendation to be successful. We are concerned that letter writers may be unintentionally writing weaker letters for students and colleagues belonging to marginalized groups. What is the evidence for this being a problem and what actions can letter writers and readers take to help reduce the impact of bias on an individual's success in physics?

What the data show

The APS Dissertation Awards provide a good example of the underrepresentation of women and minorities in situations that rely on letters of recommendation. From 2015 to 2019, the awardees include 16% women and 2% underrepresented minorities (URM) as compared to 29% of the student members who describe themselves as women and 4% of students who described themselves as members of underrepresented racial and ethnic groups. (While APS updated its demographics reporting options in 2019 to allow for non-binary reporting, these data include responses from when non-binary reporting was unavailable.)

We can also see that efforts to combat bias may be paying off when it comes to prizes and fellowships, but we caution that continued efforts are needed. Those selected for fellowships (16% women, 2% URM), prizes (10% women, 2% URM), and awards (17% women, 6% URM) can be compared to 18% of full members that describe themselves as women and 2% that report belonging to an underrepresented group.

Letters do contain bias

Some of the issues we have seen in reviewing letters include the use of communal descriptors (eager, kind, nurturing), terms that are irrelevant to the award (overcame their background), or statements that offer comparison to the marginalized group rather than the broader community (e.g., 'given that there are so few of this marginalized group in physics, the nominee of this background, is a worthy candidate'). In contrast, the most effective letters focus on these candidates' accomplishments.

As letter writers, we may not always be aware of the subtle ways that our language can (unintentionally) impart bias or judgment. In particular, there are ethnic, gender, and racial stereotypes that can creep into the writing. Stereotypes influence both the selection of candidates for a position and the evaluation of their work. As an example, research has shown that writers often "hedge" when talking about members of marginalized groups using phrases like "X" has potential, and "Y" may be able to lead [1].

This type of language makes it less likely that marginalized groups' members will make it further through the selection process. However, even comments that could have been intended as supportive like "She juggles her career and young family well" can be problematic. How often would such a phrase be in a letter for a male candidate? This remark also provides information that interviewers cannot ask for and is not relevant to the candidate's qualifications.

Human societies often associate traits with gender, race, and ethnicity. Examples in western culture include the stereotype of females being relationship-oriented or communal and males being achievement-oriented and agentic [2]. The perceived mismatch between the characteristics needed to be considered a successful individual and the (communal) behaviors stereotyped to females puts female leaders at a disadvantage. This problem is common enough that tools exist to analyze reference letters for gendered language. We



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posit that this language might be resulting in unconvincing letters of support. Since some agentic words like "dedication" are associated with female leaders and compare favorably with terms such as "dominance" used to describe males, the solution to removing bias from our letters is not as simple as removing all words with a potential for causing bias.

Similarly, racial and ethnic marginalized groups face several stereotypes, some that are considered counter to the traits of a successful individual (e.g., incompetence, machismo, and dominance in the case of Black and Latinx persons) and some that are supportive of success (such as hardworking and smart for Asian individuals) [2]. Grimm et al. quantified the frequency of agentic and communal language in over 2,600 letters of recommendation for diagnostic radiology residency applications. To our knowledge, a study on the influence of the language used in recommendation letters has not been done in a physics context, but like in physics, most of the letter writers are of senior rank, white, and male. The letter writers emphasize individual skills when describing white and Asian applicants compared to Black and Latinx applicants. These stereotypes influence both the selection of candidates for a position and the evaluation of their work. Similarly, just as writers need to be careful of their word choices, it is equally vital that selection panels and others reading the letters be aware of how language usage influences the ranking of applications [3].

How to write unbiased letters

If we are to avoid sabotaging a candidate, we need to be deliberate about the strategies we use to write supportive letters of recommendation. The ideas below come from publications and our own experiences reading and writing letters. (We found the University of Arizona [4] and IGEN guides [5] helpful.)

A key recommendation is to evaluate the adjectives you are using to describe the candidate. While it is not possible to create a strict list of adjectives to use and avoid, we suggest avoiding words that imply supporting roles and emphasize adjectives associated with mastery. Accomplishments speak louder than effort. Sometimes, asking yourself if you would have used this language to describe a white cis-gendered man may help you identify problems.

We recommend being mindful of comparisons [6]. Often letter writers will compare the candidate's achievements to others in the field. A comparison to another person may be tempting as a way to summarize achievements, but it can be problematic in several ways. First, is this a fair comparison? Did the person have the same resources and opportunities if they were in a marginalized group? Are the two people at the same place in their careers? What exactly are you comparing? Everything about them or just some aspects?

Second, do you know the person you are comparing to well enough to be sure of the comparisons? Perhaps, you are saying the candidate published a similar number of papers to a more senior person, but, unknown to you, the senior person is often added on publications while not contributing much. A reader may assume you are implying that the candidate is also added to papers they have not contributed to significantly. A related problem is the tendency to compare those within a particular identity. For example, writing "This person is the most accomplished woman in her field." does not compare a candidate to those in the discipline as a whole and could be interpreted as meaning the men in the field are more accomplished generally.

Unconscious bias can also influence which topics are included in the letter. Again, anything you cannot ask about in

an interview should not be included in a letter, even if you see it as a positive, like stressing that a candidate could complete the project even while getting treated for a severe illness. Instead, focus on specific accomplishments (e.g., He was able to develop a new analysis scheme that allowed us to account for many systematic effects in the experiment.) Discuss the candidate's specific contributions and not those of other people in the research group. We have read many letters where a significant portion details all of a lab mate's contributions rather than those of the candidate.

Besides specific accomplishments, consider commenting on a candidate's broader "professional skills" (e.g., mentorship, communication, etc.), which are often equally important for future success in their next position. Consider how those skills are discussed and use language that is part of professional norms (e.g., use "collaborative" instead of "works well with others"). Overall, we suggest focusing on what is essential to that specific job or nomination and not including anything not directly related to the position or award.

Finally, after reading through your letter with all of these recommendations in mind, we suggest that you have a colleague with a fresh perspective read through the letter with a specific eye to these issues. Additionally, you may compare the language in letters you have written for a person from a marginalized group to your letters for candidates from a majority group.

Beyond writing letters

Although these recommendations are aimed at letter writers, readers who are evaluating candidates should also keep them in mind. If you see language or discussions that could invoke a gender, racial, or ethnic bias, you can note these things to (1) consider if they affected your evaluation of the candidate and/or (2) bring it to the attention of other evaluators so they can also be aware of how this might have impacted their evaluation. These actions may lessen the impact of biased letters. Some committees find it useful to designate one member, in particular, to ensure effective practices are followed.

Overall, taking increased care with letters of recommendation is just one small step to reducing barriers for people from marginalized groups. As we take these immediate smaller steps to help better promote our colleagues and students as a community, we must continue to work on eliminating systemic racism and sexism from the field of physics.

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