MEMBERSHIP UNIT PROFILE

Vibrant Networking in the Far West Section

BY AIBOAGI DOVE

Three thousand members strong, the Far West Section (FWS) is the largest geographical section in APS, forming a home for researchers based in California, Nevada, and Hawaii. Given the lively academic and industrial climate in the far west, it should come as no surprise that FWS is one of the most vibrant geographical sections in the Society’s ranks.

Geographical sections are an important part of the APS eco-system: In addition to acting as a networking platform for physicists in different fields and at different stages of their careers, they also provide a vehicle for interactions between nearby academic institutions (from small liberal arts colleges to large research universities), government laboratories, and enterprises.

FWS was established in 2000 as the California section—one of the first to be founded as part of an APS initiative to build a bigger grassroots presence across the country. Nevada was added to the constituency in 2009, followed by Hawaii in 2013. At present, geographical sections have expanded to encompass the entire U.S.-In addition to FWS these include Four Region (ORPS), Southeastern (SESAPS), Prairie Section (PSAPS), Southern States (SSAPS), and Texas (TSAPS).

FWS chair Patti Sparks (Harvey Mudd College) characterized involvement in a geographical section as a valuable form of “continuing education” for APS members. For students, early career researchers, and senior staff alike, geographical sections foster opportunities to learn about research at other institutions and—in contrast to more discipline-centered membership units like divisions, topical groups, and forums—can provide unique exposure to other areas of physics outside of one’s particular field.

This is especially true for FWS: The section features researchers with notable strength in astrophysics, high energy physics, and nuclear physics. In Sparks’ estimation, a primary reason for this broad expertise is the section’s backbone of state universities and small undergraduate-focused institutions, which tend to specialize in areas that don’t require expensive and elaborate equipment. With the arrival of members from Nevada, FWS has broadened its strength in plasma physics, AMO (atomic, molecular, and optical physics), atmospheric science, condensed matter, and high pressure physics.

A particular point of pride for FWS is its Annual Meeting—hailed as a kind of “mini-March Meeting” for APS members in the far west part of the country. The FWS Annual Meeting involves plenary sessions with leaders in their respective fields along with contributed talks and a poster session. Many of the presenters are undergraduates and graduate students having their first experience of discussing their work at a conference.

The team’s days at Maryland were packed with rigorous physics lectures, problem-sets, labwork, and tests, where the high school students were tasked with digesting college-level material at a swift pace.

“This camp elevates their physics knowledge to a whole new level,” remarked Itai Dong, the team’s new academic director and an associate professor at Bucknell University. While this is her first year serving as director, Dong has worked with the team for years as a coach and as co-director, finding it rewarding each year to work with the students.

“It’s important for these students to find community here, to study together, and spread the love and joy of physics,” said Dong.

The training camp is sponsored annually by the American Association of Physics Teachers (AAPT) along with APS, the American Geophysical Union.

The team’s days at Maryland were packed with rigorous physics lectures, problem-sets, labwork, and tests, where the high school students were tasked with digesting college-level material at a swift pace.

“This camp elevates their physics knowledge to a whole new level,” remarked Itai Dong, the team’s new academic director and an associate professor at Bucknell University. While this is her first year serving as director, Dong has worked with the team for years as a coach and as co-director, finding it rewarding each year to work with the students.

“It’s important for these students to find community here, to study together, and spread the love and joy of physics,” said Dong.

The training camp is sponsored annually by the American Association of Physics Teachers (AAPT) along with APS, the American Geophysical Union.

For more information, contact Dong at dong@bucknell.edu.
Murray Gell-Mann 1929-2019

Murray Gell-Mann, who laid the groundwork for modern theoretical particle physics, died May 24 at his home in Santa Fe, New Mexico. He was 90.

In addition to the Nobel Prize in Physics he won in 1969 for “for his contributions and discoveries concerning the classification of elementary particles and their interactions,” Gell-Mann was also awarded prizes for his environmentalism and humanism. He was an early member of the independent advisory group JASON, a member of the National Academy of Science, and a Fellow of APS.

As a young physicist, Murray was both inspiring and intimidating,” said 2019 APS President David Gross. “He professed to know everything about everything and was usually correct.”

Almost no part of today’s Standard Model was unaffected by Gell-Mann’s contributions. At a time when new particles seemed to pop up weekly, he brought order to what was becoming an intractable zoo of hadrons and mesons by reducing them to their fundamental constituents.

“There’s nothing more satisfying to a physicist than to find the hidden order beneath all the chaos,” said Sean Carroll, a theoretical physicist at Caltech. “And he was better than anyone in the world at doing that.”

Gell-Mann had not always wanted to become a physicist.

Physics was a compromise with his father, who thought engineering would be a more stable source of income than his other interests in linguistics, archaeology, and evolutionary biology. Later on, these passions would lead to Gell-Mann’s work co-founding the interdisciplinary Santa Fe Institute, where he was finally able to blend simple principles of physics to explain complexity in other realms.

A perfectionist, Gell-Mann was well-known for his insistence on

MILLIE DRESSELHAUS

Honoring her remarkable scientific career and legacy, APS has created the Millie Dreselhaus Fund for Science and Society to reflect and support areas in which she excelled and on which she left her indelible mark.

Learn more and donate today: go.aps.org/dresselhaus

**Murray Gell-Mann continued on page 2**
targets used in the scattering experiments, enabling them to determine the structure of silicates and other more complex crystals. From 1917 to 1918, he briefly served as director of the National Physical Laboratory in Teddington but was unhappy with how much administrative duties kept him from doing research.

Then Rutherford died, and Bragg was selected to replace him as director of the Cavendish Laboratory at Cambridge. While its stellar reputation had been built on atomic physics, Bragg proved an able administrator and set up a small research group in crystallography. Among his early students: an Austrian refugee named Max Perutz, who went on to use x-ray diffraction to unlock the structure of large biological molecules like myoglobin and hemoglobin. Perutz shared the 1962 Nobel Prize in Chemistry with John Kendrew and Peter Medawar for determining the structures of silicates and proteins.

NIST neutron trap for measuring neutron lifetime. A free neutron entering the trap as part of a beam will decay into a proton, an electron, and an antineutrino. The number of neutrons detected can be used to calculate the neutron lifetime. (Image: F. WEBBER/NIST)

**APRIL MEETING**

**Sorting Out the Neutron Lifetime**

BY SOPHIA CHEN

F or over a decade, physicists have puzzled over the neutron lifetime: how long, on average, it takes the isolated particle to decay into a proton, electron, and antineutrino. Counting the number of neutrons in a container over time, they measure the half-life to be about 10 minutes. Using a different experimental method where they count one of the neutron’s decay products, they measure the lifetime to be about 8 seconds longer.

“This is an exciting time to work in the field,” says Shannon Hoogerheide of the National Institute of Standards and Technology (NIST). In 2018, three independent teams of physicists published new measurements of the neutron lifetime, which have improved precision but preserve the discrepancy.

During a mini-symposium at this year’s APS April meeting in Denver, experts gathered to develop strategies for resolving the discrepancy, including a tantalizing theory involving dark matter decay. But the discrepancy could still be due to that same reason: the decay process is not yet well understood, so some groups are working to make better measurements.

“巳’ve taken more lifetime data this year, and we’re analyzing it right now,” says Kevin Hickerson of the University of California, San Diego, theory, proposed by Bartosz Fornal at Rice University, suggests that a particle with a mass of about 1 GeV, about 100 times lighter than the weakly interacting massive particles usually predicted by supersymmetry. If neutrons occasionally became dark matter particles, that would explain why the discrepancy arose from an unknown decay product.

Researchers were particularly excited to discuss whether the discrepancy arose from an unknown dark matter decay product. This theory, proposed by Bartosz Fornal and Benjamin Grinstein of the University of California, San Diego, has the neutron decaying into a dark matter particle 1 percent of the time. This particle would have a mass of about 1 GeV, about 100 times lighter than the weakly interacting massive particles usually predicted by supersymmetry. If neutrons occasionally became dark matter particles, that would explain why the discrepancy appears to decay more quickly in the bottleneck stage than proton decay products appear in the beam experiment. “This turns out to be how nature works, this would turn out to be a very inexpensive way of trying to probe dark matter,” says Fornal.

**NEUTRON CONTINUED ON PAGE 5**

George Zimmerman, who passed away in May, led a life of distinguished service in physics and education. His wife of 54 years, Isa, also an accomplished educator, says that he was a remarkable man with a remarkable story.

Born in 1935 in Katowice, Poland, George’s family hired a guide to help them escape Hitler’s regime, but the guide took their money and turned them over to the Nazis at the border. From there, the family was split up and George and his father were transported to the Auschwitz concentration camp. George survived by a quirk of fate—he had contracted scarlet fever and was quarantined at the camp clinic. He was still there when the camp was liberated.

After the war, he found his mother and was adopted by a distant relative. They were moved to New Haven, Connecticut. George went to Yale University and received his PhD in 1963 in condensed matter physics, after which he joined Boston University as a professor of physics and later Department Chairman. Until he became emeritus professor at BU in 2001, his research focused on superconductivity, magnetism, and various aspects of low temperature physics. In the 1990s, he founded and led the Zeffres Corporation, which fabricated specialized materials for high-temperature superconductor applications.

George’s lab was like the United Nations,” says Isa. “At one point, he had about half a dozen students and they were from all over the world.” In addition, he ran a summer program for high-school students who had taken physics in their junior year. The program still exists, thanks to NSF funding and Boston University’s adoption of it, she says.

Isa Zimmerman has been an educator, with experience spanning 50 years and is president of REA Advisors, a STEM education consultancy. She has been a superintendent, a high school principal and an assistant principal, junior high school teacher, division director of the Technology in Education Association and an associate professor at Lesley University. She was senior fellow for STEM at the University of Massachusetts Donahue Institute and the UMass Presidential’s Office. She was a member of both the Massachusetts and City of Boston Governor’s STEM Advisory Councils.

As part of their estate planning before George passed away, he and Isa chose APS as one of the organizations they wanted to support and joined the APS Legacy Circle. “He was very active and cared a lot about the organization,” says Isa. “My advice is, if you are a physicist and want to leave a legacy for the future, APS is a good organization to work with.”

For more about George Zimmerman, see “The Triumph of the Weakly Interacting Massive Particle Survivors” by Bernice Lerner (University of Notre Dame Press, 2004).

Planned giving (aps.org/about/support/planned.html) is one of many ways you can donate to APS. Here’s also consider joining the APS Legacy Circle (aps.org/about/support/legacy.html) as a way to support the work of APS. For more information, contact Irene T. Lukoff, Director of Development, at 202-209-3324 or lukoff@aps.org.

**DEVELOPMENT**

Holocaust Survivor George Zimmerman leaves Legacy to APS

George Zimmerman was an accomplished educator, with experience spanning 50 years and is president of REA Advisors, a STEM education consultancy. She has been a superintendent, a high school principal and an assistant principal, junior high school teacher, division director of the Technology in Education Association and an associate professor at Lesley University. She was senior fellow for STEM at the University of Massachusetts Donahue Institute and the UMass Presidential’s Office. She was a member of both the Massachusetts and City of Boston Governor’s STEM Advisory Councils.

As part of their estate planning before George passed away, he and Isa chose APS as one of the organizations they wanted to support and joined the APS Legacy Circle. “He was very active and cared a lot about the organization,” says Isa. “My advice is, if you are a physicist and want to leave a legacy for the future, APS is a good organization to work with.”

For more about George Zimmerman, see “The Triumph of the Weakly Interacting Massive Particle Survivors” by Bernice Lerner (University of Notre Dame Press, 2004).

Planned giving (aps.org/about/support/planned.html) is one of many ways you can donate to APS. Here’s also consider joining the APS Legacy Circle (aps.org/about/support/legacy.html) as a way to support the work of APS. For more information, contact Irene T. Lukoff, Director of Development, at 202-209-3324 or lukoff@aps.org.
For the past 14 years, APS has been sending comic books featuring the escapades of Spectra, a superhero with laser powers, and PhysicsQuest teaching kits linked to the books’ physics concepts to classrooms around the world. The outreach team at APS traveled to venues like Comic-Con International in San Diego to spread the word and interact with fans of all ages. Now, Spectra and PhysicsQuest have hit the Mile-High City, with an exclusive workshop at the Denver Pop Culture Con this past May.

James Roche, APS Outreach Programs Manager, headed up the workshop on May 31, assisted by Rebecca Thompson, author of the Spectra comics. For an audience of teachers and science fans, Roche and Thompson explained how to best use the PhysicsQuest kits in a classroom and demonstrated an experiment from Spectra’s Energetic Escape.

“Any time there is opportunity to connect our programs to new audiences, we get excited. The Spectra comics and the PhysicsQuest program are natural fits at comic conventions, and the Denver Pop Culture Con was no exception,” says Roche. “The glowing reception from educators and attendees who stopped by the Spectra booth and the subset that attended the PhysicsQuest workshop is exactly what drives us to push forward.”

The APS PhysicsQuest program has been sending comic books and accompanying kits, which include a teacher’s guide and materials for original physics demos, to middle schools, high schools, and museums.

Physics Quest: Spectra’s Energetic Escape is the 15th kit produced by APS and accompanies the 18th issue of the Spectra series.

Each issue of Spectra incorporates a set of physics concepts into the adventures of Lucy Bene—aalias Spectra—a middle school student with the power to turn into a human laser beam. Energetic Escape sees Spectra and friends using their knowledge of pendulums, friction, and potential energy in a competition for concert tickets that turns dangerous.

Roche and Thompson demonstrated a pendulum experiment from last year’s kit, bringing the concepts from the comic book to life. As Roche demonstrated the experiment, Thompson discussed ways students could gather both qualitative and quantitative data from the experiment in a classroom.

“Pendulums are a great experiment when working with potential and kinetic energy, and there’s all kinds of things you can have students measure,” Thompson explained during the session. “You can have them record frequency and find the period of the pendulum with a stopwatch, and they can also experiment with different pendulum lengths or using multiple pendulums.”

A chain of rubber bands, stretched between two chairs, supported four pendulums, made from metal nuts and pipe cleaners of two different lengths. By having sets of pendulums at these different lengths—one set at six inches and the other at two and a quarter—the experiment goes beyond just measuring the frequency or period of a single pendulum, but also delves into the resonant energy transfer that goes on between pendulums of the same length. Swinging one six-inch pendulum will eventually cause the other—but not the shorter pendulums—to swing too.

The PhysicsQuest Teacher’s Guide includes a full explanation of this experiment and three others: Friction Fun, Straw Rockets, and Pinwheel Power. Student guides are also included with instructions for conducting the experiment, collecting data, and analyzing the results. A new PhysicsQuest kit covering thermodynamics will be available this year, thanks in part to funding from Google, and a special LIGO edition of Spectra on gravitational waves is also in the works.

PhysicsQuest continues to be an integral part of our public engagement, says Roche. “Over the past year, we’ve strived to evaluate and improve the program to better serve the students and educators that have made it such a success.”

For more on the Spectra series and the PhysicsQuest program visit physicstcentral.com/experiment/physicsquest.

###

Amber has been a destination for the best and brightest students in the world who contribute to our cutting-edge research projects. Unfortunately, we’re losing our draw as many international students confront challenging legal paths to study in the U.S. Many of these world-class students are now going elsewhere, to the benefit of other countries. Thankfully, U.S. Senator Cory Gardner is in a position to help preserve our country’s global science leadership.

It’s no secret that part of America’s economic success comes from the ability of immigrants. My grandparents and great-grandparents came to this country and helped build the cities and towns they lived in, creating our society. From construction to technology to pharmaceutical and energy development, our country would not be where it is today if it wasn’t for the contributions of immigrants. Immigrants have been the driving force behind the American economy and we need to embrace our diversity.

Despite the complexities surrounding immigration, Congress must provide a path to citizenship for students already in the U.S. If the Senate passes the bipartisanREAM Act, it will provide a pathway to citizenship for qualified immigrant students and those currently enrolled in the United States. We need to make sure that all students are provided with the opportunity to reach their full potential.

Lamming Lab Workforce Shortfall Worries Top Appraiser

BY JONATHAN BEHRENS

The Department of Energy (DOE) this spring, Rep. Mark Pocan (D-WI) announced his interest in addressing the impending wave of retirements at federal laboratories. DOE has considerable influence over DOE’s 17 national laboratories as chair of the House’s appropriations committee. DOE is developing technical talent. These students are technicians,” she said. “We didn’t address it heavily in the bill because I don’t want the future of the Department of Energy to be hung on the outcome of one retirement age, representing a serious retirement challenge that is exacerbated by the private sector’s ability to offer higher salaries.

“For some time now, the country think about how to piece together an initiative that would help to draw young people into the sciences using the power of our research labs?”

Among the federal labs facing significant staffing challenges are the three overseen by DOE’s National Nuclear Security Administration (NNSA): Los Alamos, Lawrence Livermore, and Sandia National Laboratories. Together they certify the safety and reliability of the current nuclear stockpile, contribute to arms control discussions, and support a broad portfolio of scientific research.

NNSA Administrator Lisa Gordon-Hagerty has stressed the labs’ growing workforce needs at several congressional hearings this year. Speaking before the Senate Armed Services Committee in May, she noted that more than 40% of DOE’s nuclear weapons-related work is scheduled for retirement over the next five years at a time when the agency is facing its heaviest workload since the end of the Cold War.

“Los Alamos is looking to hire 3,500 people this year. Sandia is looking to hire 1,000 people. Livermore is looking to hire 500 people,” she told the committee.

“We’re talking about really thousands of people in our workforce, not only in the next five years, but now, in order to handle the increasing workload that’s on us,”

NNSA is currently undertaking a comprehensive modernization of the nuclear security enterprise to address shortfalls stemming from aging infrastructure across the weapons complex. Through its Nuclear Posture Review, the Trump administration has also directed the agency to develop a weapons workforce and production infrastructure that is responsive “to potential” to shifts in the geopolitical or technical landscape.

NNSA Administrator Lisa Gordon-Hagerty said it is crucial that NNSA develop a new paradigm for recruiting given the magnitude of its staffing needs. She explained the agency is experimenting with new mechanisms to attract and retain technical talent. These include partnering with universities to develop training programs for specific areas of need, such as radiological technicians, and holding much larger recruitment fairs that leverage rapid hiring procedures.

“We are finding different ways of trying to resource, if you will, or source the next generation, the best and brightest. And those are scientists, those are engineers, those are technologists,” she said.

The author is a Science Policy Analyst with FYI. FYI has been a trusted source of scientific policy and funding news since 1989, and is read by members of Congress and their staff, federal agency heads, journalists, and U.S. scientific leaders. Sign up for free FYI emails at aip.org/fyi.

---

**OUTREACH AND PUBLIC ENGAGEMENT**

**PhysicsQuest Reaches New Heights**

BY LEAH POFFENBERGER

PhysicsQuest, a free learning module available this year, thanks in part to funding from Google, and a special LIGO edition of Spectra on gravitational waves is also in the works.

PhysicsQuest continues to be an integral part of our public engagement, says Roche. “Over the past year, we’ve strived to evaluate and improve the program to better serve the students and educators that have made it such a success.”

For more on the Spectra series and the PhysicsQuest program visit physicstcentral.com/experiment/physicsquest.

**GOVERNMENT AFFAIRS**

**International Students Key to Colorado Economy**

BY NOAH FINKELSTEIN

“Pendulums are a great experiment... when working with potential and kinetic energy, and there’s all kinds of things you can have students measure,” Thompson explained during the session. “You can have them record frequency and find the period of the pendulum with a stopwatch, and they can also experiment with different pendulum lengths or using multiple pendulums.”

A chain of rubber bands, stretched between two chairs, supported four pendulums, made from metal nuts and pipe cleaners of two different lengths. By having sets of pendulums at these different lengths—one set at six inches and the other at two and a quarter—the experiment goes beyond just measuring the frequency or period of a single pendulum, but also delves into the resonant energy transfer that goes on between pendulums of the same length. Swinging one six-inch pendulum will eventually cause the other—but not the shorter pendulums—to swing too.

The PhysicsQuest Teacher’s Guide includes a full explanation of this experiment and three others: Friction Fun, Straw Rockets, and Pinwheel Power. Student guides are also included with instructions for conducting the experiment, collecting data, and analyzing the results. A new PhysicsQuest kit covering thermodynamics will be available this year, thanks in part to funding from Google, and a special LIGO edition of Spectra on gravitational waves is also in the works.

PhysicsQuest continues to be an integral part of our public engagement, says Roche. “Over the past year, we’ve strived to evaluate and improve the program to better serve the students and educators that have made it such a success.”

For more on the Spectra series and the PhysicsQuest program visit physicstcentral.com/experiment/physicsquest.

**AMERICANS CONTINUED ON PAGE 7**
**EDUCATION AND DIVERSITY**

**STEP UP: Changing the Face of Physics**

Do you know any high school physics teachers? Did you know that they are the most cited source of inspiration for young women pursuing a physics degree in college? Although half of high school physics students are women, they go on to make up only 20% of physicists at the undergraduate, graduate, and early professional levels. This is why APS and its partner institutions have spent the last two years in a new, but vital, venue for changing the face of physics: high school physics classrooms.

The STEP UP project has built a national consortium of physics educators, researchers, and professional societies to optimize two self-contained lessons for physics classrooms. STEP UP’s lessons have shown great effects, especially for young women, of increased student interest and the pipeline to pursue a career in physics. Now, these lessons need to be adopted by high school physics teachers to lead to a national boost in women’s interest in physics when declaring college majors.

This is where you come in! Ask a teacher to register with STEP UP at stepupphys.org. Sign up yourself to continue to support the STEP UP movement. Reach out to local high school physics teachers or other networks of physics teachers and recruit them to join the campaign. Together, we can ensure that future generations of physics majors include the rich diversity that the country has to offer.

**Save the Date!**

National Mentoring Community Conference 2020, February 6 – 8, 2020, University of Central Florida, Orlando, Florida

The APS National Mentoring Community Conference 2020, held in partnership with the National Society of Black Physicists and National Society of Hispanic Physicists. We encourage undergraduate physics students from underrepresented groups, faculty interested in discussions of diversity and mentoring within physics education, representatives from summer research internship programs, and other physics professionals to attend.

Travel and housing funding will be available for NMC Mentors and Mentees.

For more information visit the conference website at aps.org/programs/minorities/nmc/conference/

**Save the Date!**

2020 PhysTEC Conference to be held February 29 – March 1 in Denver, Colorado.

Join us at the nation’s largest meeting dedicated to the education of future physics teachers, immediately preceding the APS March Meeting 2020, and attend workshops on best practices, panel discussions by national leaders, and excellent networking opportunities for physics teacher educators. Visit the PhysTEC conference site at phystec.org/conferences/2020/

**Funding for New PhysTEC Sites**

PhysTEC expects to award Recruiting Grants to up to five new sites. Awardees will receive $25,000 to implement a two-year improvement plan that focuses on implementing some of the best practices found in the PhysTEC Rubric. Funding is set to begin on July 1, 2020. The rubric, the full Request for Proposals, and submission instructions are available on the PhysTEC website at phys.tec.org. Proposals are due September 27, 2019 at 5 p.m. local time.

**NEUTRON CONTINUED FROM PAGE 3**

However, new analyses have already provided some of Fornal and Grinstein’s suggested experimental signatures, including a secret to resolve the issue of gamma ray and one that produces an electron–positron pair. At the meeting, theorists debated whether the dark matter decay product is consistent with observed neutron stars. Some theorists had suggested that this dark matter particle would render neutron stars at observed masses unstable. They have to know — and resolve — the issue of the shape of the neutron star's core, according to Fornal, by introducing realistic models. But even in the absence of a detailed model of neutron star cores, physicists can compare the observed neutron star masses. These can provide clues to whether the neutron star core is made of more exotic matter, or whether it has a more simple structure. The neutron lifetime is important for many applications in cosmology. For example, it helps determine the amount of light elements, particularly helium-4, that formed from hydrogen right after the Big Bang. “Helium is made by protons capturing neutrons,” says Hickerson. “So the rate at which neutrons disappear from the early universe determines how fast helium can [combine with] protons to form helium.”

Hickerson and his colleagues have created an open-source code called Alter8v8 to simulate the production of light elements, in which the neutron lifetime is a variable. They then compare the element abundances produced in the simulations to spectroscopic observations of low-metallicity clouds of gas from the early universe (astro-physicists call elements heavier than hydrogen or helium “metals”). The atmospheric observations and simulations should agree with each other within their range of uncertainties, both the neutron lifetime is the limiting factor, says Hickerson. So if they can zero in on a more precise neutron lifetime, it could motivate astronomers to take a closer look at these gas clouds.

The UCSC collaboration is planning to build an experiment where they count neutrons and their decay products simultaneously. “It’s basically like doing a beam and a bottle experiment at the same time,” says Hickerson. They want to include a neutron counter, protons counter, and electron counter in the experiment so that it would be sensitive to Fornal’s proposed neutron dark decay.

The beam is antimaterials, meanwhile, are improving their proton counting and investigating their major systematics. Hoogerheide has high hopes for the future. “Given the number of projects working on it, we should have a U.S. experimental team to measure this within the next five to ten years,” she says.

The author is a science writer based in Tucson, Arizona.

**APRIL MEETING**

**Particle Physics on a Tabletop**

BY SOPHIA CHEN

The Large Hadron Collider may be the flashy face of particle physics, with its gargantuan tunnel and the attention of thousands of researchers. But smaller teams of physicists are quietly chipping away at similar fundamental particle physics questions using less expensive equipment. These tabletop experiments are small enough to fit in a single university lab and cost a mere $25,000 to implement, as opposed to the LHC’s billions. At the APS April Meeting in Denver this year, researchers presented their progress hunting for hypothesized exotic particles using these numbers setups.

Unlike, collider physicists, who investigate the bits and pieces left over from high-energy particle collisions, tabletop experimentalists probe low-energy systems. These physicists look for any deviations from the Standard Model in parts per billion and smaller. Deviations, if they spot them, might hint at the existence of new particles.

**ELARGED ELECTROONS**

Along with John Doyle (Starwood) and Gerald Gabrielse (Northwestern University, Evanston), David DeMille of Yale University co-leads a collaboration to measure how much of the electron is—enter the so-called electron electric dipole moment (EDM). This quantity describes how much of the particle’s negative charge is distributed. A nonzero value would mean that the electron is not spherically symmetric. Until the Standard Model, the electron is a point particle with zero EDM. But under real-world conditions, quantum field theory predicts that an electron constantly emits and reabsorbs virtual particles, which would make its charge distribution appear egg-shaped. Theory predicts that this asymmetry will, which requires a full-time academic load but prohibits off-campus employment, the H-1B visa is highly competitive. U.S. employers are not likely to hire foreign workers into specialty occupations.

Last year, a survey conducted by APS OGA of 49 of the largest graduate physics programs in the U.S. revealed that the percentage of international students applying declined by an average of 12 percent from 2017 to 2018. In response, APS members urged APS OGA to write op-ed and make presentations to congressional staffers, both locally and nationally. They have continued to work closely with APS OGA and the APS Federal Affairs Officer, “We’re stepping up our use of data to make a more effective case for our science policy initiatives, and we plan to use the information to ultimately help continue to attract the bright and brightest students to the U.S.”

Allen Hu, APS Policy Analyst, said the FISSA survey will include questions such as:

- Did you have any issues with renewing your student visa to study in the United States?
- Did you have any issues delivering your renewal visa application to your program’s completion of your program study?

- Have you dealt with any issues while transitioning from an F-1 student visa to an H-1B visa?

In contrast to the F-1 student visa, which requires a full-time academic load but prohibits off-campus employment, the H-1B visa is highly competitive. U.S. employers are not likely to hire foreign workers into specialty occupations.

Visa Policy Continued on Page 6
GELL-MANN CONTINUED FROM PAGE 2

AMERICAN PHYSICS SOCIETY
APL: PHYSICAL REVIEW D CONTINUED FROM PAGE 1

APS NEWS
- Physics Today
- Physical Review D
- Of the Capitol

The full text of the ethics guidelines adopted by the APS Council is available at aps.org/policy/statements/guidelines/ethics.html.

The author is the APS Senior Press Secretary.

APL: PHYSICAL REVIEW D CONTINUED FROM PAGE 1

The Ethics Committee will provide resources to promote ethical best practices through educational programs and events organized at APS meetings. At the inaugural meeting of the Ethics Committee, a subcommittee was tasked with creating a new Community website, with the vision of it becoming a hub for the physics community to access materials to promote ethical practices.

Another task of the Ethics Committee will be to create a policy for revocation of membership or honors based on instances of ethical misconduct or harassment.

"Part of our charge is to consider the way that we’re going to respond to allegations of different forms of harassment," says Marder. "We’ll have to consider the question of whether there may be circumstances where revocation of APS membership might be appropriate, where individuals might not be eligible for awards and other honors—there are members of the APS who feel this is an urgent matter to consider and the committee is considering what we should do.

For more on the new APS Ethics Committee, visit aps.org/about/government/committees/ethics.

American Institute of Physics, and its member organizations, providing a challenging but exhilarating experience for the high schoolers. The program is designed to encourage all students to study physics and give team members a unique chance to travel internationally. To qualify, students on the team had to show exceptional performance on a series of exams administered at secondary schools all across the country.

Since 1986, when the U.S. first participated in the International Physics Olympiad, the team has consistently ranked in the top ten, and they hope to bring home more medals this year.

The author is a freelance science writer based in New York.
For international students we would only help Colorado's economy. According to the Center for American Progress, which tracks such data, as of 2017, 30 percent of Fortune 500 companies based in the state were founded by immigrants or their children. Ball Corp., a Broomfield-based metal packaging company with a major aerospace division, is one such company. “We employ a workforce that the company employs more than 17,500 people throughout the world. And last year, it boasted net sales of $11.6 billion. And, together with plenty to do in the region, we were able to attract a diverse amount of state. But Ball's CEO, Pete Sparks, says they have a much more important role as the Consortium is an integral part of the PW's comprehensive plan. The author is a freelance writer in Helsinki, Finland.
The Future of APS: Engaging Early Career Members for Equity and Inclusion

BY JULIA GONSKI

Over 40% of current APS membership is composed of student or early career scientists [1]. This group encompasses an incredible variety of physicists, from attendees of the Conferences for Undergraduate Women in Physics all the way to junior faculty. As the sole female student on the APS Council for the past four years, I have learned that it’s not an easy task to provide tailored and effective support to such a diverse constituency. But it is an important one.

APS considers early career members to be students or scientists within five years of receiving their PhD degrees. These typically young physicists are often drawn to the Society by professional opportunities (think meetings or journals), with perks like travel grants and career resources providing a crucial added value. And at a career session that they do. Not only are our early career members vital to APS at present, but they represent the future leadership of the organization.

So how can we attract even more young scientists to APS? And are we doing all that we can to support them? When I attended my first APS Council meeting in 2016 as the Forum on Graduate Student Affairs (FGSA) Councilor, these were not just discussion topics. Given that I had an ear to the ground of the student community, I was aware of certain problems that keep reappearing for this group, problems that everyone knows are occurring, but no one knows quite how to solve.

These thorny issues are linked to power dynamics in academia, where at the top hold immense sway over more junior participants. In this regard, there are strong connections between the experiences of young scientists and those of scientists from underrepresented demographics. For one, young scientists are generally the most diverse group within physics. But even further, in academic power structures both groups are underempowered, in that their opportunities are disproportionately influenced by forces outside of their control.

“Race-based discrimination, unreasonable work expectations, and ethical violations in research committed by an adviser can all have catastrophic effects.”

There’s no shortage of recent literature about the prevalence and effects of sexual harassment in the physics community. But this is just one example in which an improperly wielded power structure can unfairly hinder an individual’s progress in physics. Race-based discrimination, unreasonable work expectations, and ethical violations in research committed by an adviser can all have similarly catastrophic effects.

Given the challenges of pushing back against abuses in such a hierarchical structure, APS stepping to the forefront on these issues would truly be a game changer for the early career community.

In bringing these issues to light with APS leadership, I found that a general consensus quickly emerged: something had to be done. We planned to hold an early career session at the November 2018 Council meeting, dedicateing four lines, to create top-down change.

The actions I’ve mentioned here are truly just the tip of the iceberg for addressing equity-related issues and increasing early career scientist representation in APS. The coming years will see a greatly increased variety of new opportunities for junior members, in both established programs like Congressional Site Visit and the popular Climate Site Visit program (aps.org/programs/women/sitevisits/). With a session in the books and with the report in hand, the Council was ready and able to act. In April 2019, we revisited the topic of junior member empowerment, incorporating the report recommendations, and passed two critical motions. The first was to mandate an early career member on all APS Unit executive committees, an enormous step for young physicist representation in society leadership. Second, the Council tasked a joint working group of the Committee on the Status of Women in Physics and the Committee on Minorities with exploring an expansion of the popular Climate Site Visit program (aps.org/programs/women/sitevisits/).

Specifically, the site visit program should incorporate requests from students or junior members of a physics program, rather than solely from the department’s chair. This holds a huge opportunity for students working in harmful university environments and unsure of where to turn for assistance. Though ultimately a site visit cannot proceed without the consent of the department, allowing requests from those in lower positions of power helps APS allocates its resources to the students who need them most.

In conjunction with the new standing Ethics Committee (see page 3), we hold promise for a future in which all young physicists are empowered to demand the treatment, environment, and career in physics that they deserve.

On a personal level, I am incredibly excited about the energy I’ve seen for tackling these issues, from all corners of APS, during my term as Councilor. And I can tell that this energy has already made a difference. Between the member survey, Council session, and follow-up report, we learned that our society can be a haven and an impactful resource for young physicists. This especially holds true in an environment where students can be driven from physics for reasons unrelated to their capability. Taking action increases young member recruitment and retention, so it is mutually beneficial for both APS and the broader early career physics community. The past few years have made it all the more clear that this is the right course, and now is the time to act.

The actions I’ve mentioned here are truly just the tip of the iceberg for addressing equity-related issues and increasing early career scientist representation in APS. The coming years will see a greatly increased variety of new opportunities for junior members, in both established programs like Congressional Site Visit and the popular Climate Site Visit program (aps.org/programs/women/sitevisits/). With a session in the books and with the report in hand, the Council was ready and able to act. In April 2019, we revisited the topic of junior member empowerment, incorporating the report recommendations, and passed two critical motions. The first was to mandate an early career member on all APS Unit executive committees, an enormous step for young physicist representation in society leadership. Second, the Council tasked a joint working group of the Committee on the Status of Women in Physics and the Committee on Minorities with exploring an expansion of the popular Climate Site Visit program (aps.org/programs/women/sitevisits/).

Specifically, the site visit program should incorporate requests from students or junior members of a physics program, rather than solely from the department’s chair. This holds a huge opportunity for students working in harmful university environments and unsure of where to turn for assistance. Though ultimately a site visit cannot proceed without the consent of the department, allowing requests from those in lower positions of power helps APS allocates its resources to the students who need them most.

In conjunction with the new standing Ethics Committee (see page 3), we hold promise for a future in which all young physicists are empowered to demand the treatment, environment, and career in physics that they deserve.

On a personal level, I am incredibly excited about the energy I’ve seen for tackling these issues, from all corners of APS, during my term as Councilor. And I can tell that this energy has already made a difference. Between the member survey, Council session, and follow-up report, we learned that our society can be a haven and an impactful resource for young physicists. This especially holds true in an environment where students can be driven from physics for reasons unrelated to their capability. Taking action increases young member recruitment and retention, so it is mutually beneficial for both APS and the broader early career physics community. The past few years have made it all the more clear that this is the right course, and now is the time to act.

The actions I’ve mentioned here are truly just the tip of the iceberg for addressing equity-related issues and increasing early career scientist representation in APS. The coming years will see a greatly increased variety of new opportunities for junior members, in both established programs like Congressional Site Visit and the popular Climate Site Visit program (aps.org/programs/women/sitevisits/). With a session in the books and with the report in hand, the Council was ready and able to act. In April 2019, we revisited the topic of junior member empowerment, incorporating the report recommendations, and passed two critical motions. The first was to mandate an early career member on all APS Unit executive committees, an enormous step for young physicist representation in society leadership. Second, the Council tasked a joint working group of the Committee on the Status of Women in Physics and the Committee on Minorities with exploring an expansion of the popular Climate Site Visit program (aps.org/programs/women/sitevisits/).

Specifically, the site visit program should incorporate requests from students or junior members of a physics program, rather than solely from the department’s chair. This holds a huge opportunity for students working in harmful university environments and unsure of where to turn for assistance. Though ultimately a site visit cannot proceed without the consent of the department, allowing requests from those in lower positions of power helps APS allocates its resources to the students who need them most.

In conjunction with the new standing Ethics Committee (see page 3), we hold promise for a future in which all young physicists are empowered to demand the treatment, environment, and career in physics that they deserve.

On a personal level, I am incredibly excited about the energy I’ve seen for tackling these issues, from all corners of APS, during my term as Councilor. And I can tell that this energy has already made a difference. Between the member survey, Council session, and follow-up report, we learned that our society can be a haven and an impactful resource for young physicists. This especially holds true in an environment where students can be driven from physics for reasons unrelated to their capability. Taking action increases young member recruitment and retention, so it is mutually beneficial for both APS and the broader early career physics community. The past few years have made it all the more clear that this is the right course, and now is the time to act.

The actions I’ve mentioned here are truly just the tip of the iceberg for addressing equity-related issues and increasing early career scientist representation in APS. The coming years will see a greatly increased variety of new opportunities for junior members, in both established programs like Congressional Site Visit and the popular Climate Site Visit program (aps.org/programs/women/sitevisits/). With a session in the books and with the report in hand, the Council was ready and able to act. In April 2019, we revisited the topic of junior member empowerment, incorporating the report recommendations, and passed two critical motions. The first was to mandate an early career member on all APS Unit executive committees, an enormous step for young physicist representation in society leadership. Second, the Council tasked a joint working group of the Committee on the Status of Women in Physics and the Committee on Minorities with exploring an expansion of the popular Climate Site Visit program (aps.org/programs/women/sitevisits/).

Specifically, the site visit program should incorporate requests from students or junior members of a physics program, rather than solely from the department’s chair. This holds a huge opportunity for students working in harmful university environments and unsure of where to turn for assistance. Though ultimately a site visit cannot proceed without the consent of the department, allowing requests from those in lower positions of power helps APS allocates its resources to the students who need them most.

In conjunction with the new standing Ethics Committee (see page 3), we hold promise for a future in which all young physicists are empowered to demand the treatment, environment, and career in physics that they deserve.

On a personal level, I am incredibly excited about the energy I’ve seen for tackling these issues, from all corners of APS, during my term as Councilor. And I can tell that this energy has already made a difference. Between the member survey, Council session, and follow-up report, we learned that our society can be a haven and an impactful resource for young physicists. This especially holds true in an environment where students can be driven from physics for reasons unrelated to their capability. Taking action increases young member recruitment and retention, so it is mutually beneficial for both APS and the broader early career physics community. The past few years have made it all the more clear that this is the right course, and now is the time to act.