This July 14th, while France admires fireworks for its national holiday, the editors of *Physics* will open a bottle of champagne (maybe two) and celebrate the publication turning 10. While younger than most of the journals in the *Physical Review* collection—which celebrate its 125th birthday this year—*Physics* has covered a lot of ground and is now much valued by the physics community.

Like the “front half” of many print journals, *Physics* highlights newsworthy papers—in this case, from the *Physical Review*—providing context for results that would otherwise be obvious only to specialists. The difference is that *Physics* doesn’t live inside any one journal, but instead exists as a separate online publication. And all the articles in it are free-to-read, with no journal subscription required.

Why *Physics*? That was the question David Voss, the founding editor of *Physics* (now editor of *APS News*), asked in his first editorial. The answer then and now remains the same: to help physicists keep up with the field as a whole. Researchers understandably write their papers for other experts, using specialized language to concisely convey their results. But would you know the meaning of “charmonium–unlike structure” if you weren’t a particle physicist or “valley degeneracy” if you didn’t study semiconductors? Even if you had an encyclopedic mind, digesting the more than 300 papers per week published in the *Physical Review* journals would be a tall order. *Physics* therefore serves as a filter, offering one or two new stories per day on papers our editors think the community will want to know about. Our storytellers are experts, journalists, and *Physics* staff writers.

**Get a Running Start in Physics**

By Leah Poffenberger

In February 2016, Kama Morey was a high school sophomore at track practice when his coach brought him an article about a new physics discovery: the first detection of gravitational waves by the Laser Interferometer Gravitational-Wave Observatory (LIGO). Now a senior at the prestigious North Carolina School of Science and Mathematics (NCSSM), Morey is contributing to gravitational wave research himself.

At the 2018 APS April Meeting, Morey presented his work on predicting the type of gravitational waves that will be measured by the future Laser Interferometer Space Antenna (LISA). His work was done in collaboration with Zach Niasipak and Charles Evans at the University of North Carolina-Chapel Hill, and Jonathan Bennett at NCSSM. “As part of my research, I looked into making potential modifications that will further the accuracy of the existing models,” said Morey. “Compared to the previous models [ours] actually performed a lot better than we thought it would.”

This kind of gravitational wave prediction is crucial for future detections: theoretical models become templates that possible gravitational-wave events can be compared to. Morey’s improved modeling technique could contribute to LISA’s detections of gravitational waves caused by extreme mass ratio inspirals—a phenomenon where two black holes, one much bigger than the other, orbit around one another, sending out gravitational waves.

These waves aren’t detected by LIGO on Earth, but LISA, which will be constructed in space and scheduled for launch in 2034, may be able to spot them. To gain the MOREY continued on page 4

**Physics for Human Rights**

By Amanda Babcock

2018 APS April Meeting, Columbus, OH—This year’s APS Andrei Sakharov Prize was presented during the April Meeting Awards Ceremony on Sunday, April 15th. The honor is awarded every two years to one or more scientists in recognition of their leadership and achievements in advocating for human rights. This year’s award showcased two individuals whose work has spanned decades: Ravi Kuchimanchi and Narges Mohammadi.

Kuchimanchi was in attendance at the awards ceremony. However, Mohammadi is currently imprisoned in Iran. Nayereh Tohidi accepted the award on her behalf. Tohidi is a professor of gender and women’s studies and director of Middle Eastern and Islamic studies at California State University, Northridge.

Both Kuchimanchi and Tohidi spoke in a session Monday morning. Tohidi read an open letter from Mohammadi, which she translated from Persian.

A river in India

At the beginning of Ravi Kuchimanchi’s work in human rights is the story of a river in India. In the summer of 2000, after completing his postdoc, Kuchimanchi volunteered with Save Narmada, a movement to protect the villages of the Narmada valley from imminent flooding caused by nearby dam construction. The villagers said the flood waters would affect many more people than the government predicted.

Kuchimanchi was able to confirm that not only were the flood levels issued by the authorities incorrect, but they were off by a full three meters. This meant disaster for tens of thousands of people, driving them from their homes. Even worse, the incorrect levels would leave many without the right to rehabilitation funding provided by the government. Bridging this disconnect between the government and the local people would become the basis for Kuchimanchi’s work with the Association for India’s Development (AID).

Kuchimanchi founded AID while a grad student at the University of Maryland. “We had a learning attitude,” Kuchimanchi said. “And the learning curve was steep. ‘We thought that either AID would exponentially grow, in which case we would spend all our lives on it. Or it would exponentially decay, in which case we wouldn’t have to put in much effort,’ he said. ‘As it turns out, it exponentially grew.’”

In the twenty-seven years since its founding, the organization has grown to at least 880 volunteers and more than 100 projects organized by 36 chapters across the United States. The work has absorbed most of Kuchimanchi’s life. He says he is unable to focus on both human rights work and physics research at the same time.

The concentration required of physics makes any other consideration difficult, but he emphasizes the importance of finding time for both. When not working for caste parity in India, he is conducting research on parity in physics.

Kuchimanchi shows deep compassion for the people he is working to help. One case he highlighted is the ongoing agrarian crisis in India. “In the past 10 years, 150,000 farmers have committed suicide in India.” He described crippling debt from loans taken out to buy pesticides, fertilizer, and fuel as "profoundly depressing.

Rights continued on page 7
Spotlight on Development
Mini-grants Make Room for New Ideas in Outreach

By Leah Poffenberger

For many people, engagement with physics ends when they walk out of a high school or college physics classroom. But a scientifically literate public is important to informed decision-making in an increasingly technological world.

Each year, APS awards its Public Outreach and Informing the Public Grants, often called mini-grants, to fund projects aimed at engaging all ages, from kindergartners to senior citizens. These selected innovative, original, and sometimes experimental projects can receive up to $10,000 to kick-start public outreach campaigns to educate—and often amaze—their audiences.

Since its inception in 2011, the public outreach grants program has supported a wide variety of projects, from physics videos to museum exhibits to a physics-based escape game (which involved volunteers using clues to rescue themselves from a fake meteoric explosion). A selection of projects from the 2018 mini-grant applications are outlined below.

Projects are selected for funding by APS Head of Public Outreach Rebecca Thompson and the APS Committee on Informing the Public, a group of public outreach and engagement experts from a variety of backgrounds and institutions. This year, eight grants were selected.

GRANTS continued on page 7

This Month in Physics History

June 30, 1908: The Tunguska Event

O
n the morning of June 30, 1908, the sparsely populated and largely indigenous Evenki natives of Siberia and Russian settlers in a remote region of Siberia saw a bright column of light streak across the sky. Ten minutes later, there was a flash of light and a brief explosion that threw up a powerful shock wave strong enough to break windows hundreds of miles away. A farmer named Sergei Semenov was one of the few eyewitnesses to the entire event while having breakfast just 40 miles from the epicenter. “Suddenly the sky appeared like a red ball split in two, high above the forest, the whole northern sky appeared to be completely covered with blazing fire,” he recalled. “At that moment, I felt a great wave of heat as if my shirt had caught fire.” Then there was loud bang and a “mighty crash,” and Semenov found himself thrown several feet from his chair.

The impact showed up on satellite seismometers around the world, in some places measuring as strong as 5.0 on the Richter scale. For several days after, the night skies glowed over Asia and Europe. In the U.S., both the Smithsonian Astrophysical Observatory and the Mount Wilson Observatory measured a sharp decrease in atmospheric transparency that lasted for months, because of all the suspended dust particles in the air after the blast.

While the spectacular event certainly garnered its share of media coverage, particularly by Russian newspapers, it would more than a decade before the first scientific expedition succeeded in analyzing the blast site. Russian mineralogist Leonid Kulik led a team to the Podkamennaya Tunguska River basin in 1921. He was conducting a survey for the Soviet Academy of Sciences, and heard the many local accounts of the explosion. Believing it had been caused by a giant meteorite, he convinced the Soviet government to fund an expedition to the region to possibly observe a giant meteorite crater. But the harsh conditions of the Siberian wilderness foil his team’s efforts to reach the blast area.

Kulik’s team made the arduous journey to Tunguska in 1927, hiring local Evenki guides to guide them to the impact site. He was surprised, upon arrival, to see that there was no impact crater. However, a five-mile swath of trees was scorched, all their branches blown off, yet still standing upright. A similar phenomenon occurred in Hiroshima, Japan, after the detonation of a nuclear bomb in 1945, and scientists concluded the Tunguska event released the energy equivalent of about 185 such bombs. Further away, trees had fallen away from the center of the blast in a radial pattern.

Over three successive expeditions, Kulik noted several small “pothole” bags that he assumed were meteorite craters. By the time the Soviet initiative to get rid of hazardous nitrile films, the prints were carefully preserved for future study. The local natives attributed the blast to Aega, the god of thunder, to punish the Evenki tribe for their internal disputes. They proclaimed the blast site a sacred space and guarded it zealously from outsiders—one reason it took nearly two decades before the site was visited by an international team.

Scientists have narrowly the likely candidates down to two possibilities over the ensuing decades. Some scientists concluded the object that exploded in the atmosphere was a comet (possibly the Comet Encke). This notion was first proposed in 1930 by British astronomer F. W. Whipple—a hypothesis supported in part by the glowing of the comet’s debris as it entered the lower atmosphere. But the harsh conditions of the Siberian wilderness foil his team’s efforts to reach the blast area.

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Today there is strong consensus that the body causing the Tunguska event was most likely an asteroid, a takeout object, a stony body in orbit of the sun destined to collide with Earth. A recent study by T. T. Groussin from the Géode (Paris) and P. Groussin from the University of Paris-Saclay said that the Tunguska event was not a comet but an asteroid with a mass of 30 to 100 metric tons, which created a crater 1,800 meters in diameter. The crater was not observed until much later, and the object was not seen entering the atmosphere. The presence of highly compressed ice in the Tunguska crater is consistent with the hypothesis that the object was not a comet but an asteroid. The Tunguska crater formed from the impact of an asteroid, not a comet.
Physicist Pinpoints Urban Gunfire

By Katherine Kornei

Robert Shown remembers working in Menlo Park, a tony city in California adjacent to East Palo Alto, the murder capital of the nation in the 1990s. It was then that the space physicist real- ized his acoustics work at Stanford Research Institute might have util- ity far beyond academia. “I thought we could tell the police where gun- fire occurred just using our knowl- edge of the propagation of acoustic waves,” he says.

In 2009, Shown founded ShotSpotter to do just that. After getting permission from a city’s government, the company installs broadband-sized acoustic sensors on buildings on telephones to record sound. When a noise resem- bling gunfire is picked up, the sig- nal is sent to ShotSpotter’s review center in Newark, California, where acoustic experts analyze the noise. Based on differences in the timing of the sounds recorded simultaneously, the Shotspotter system can pinpoint the location of the gunfire, to a radius of between 25 and 50 meters. This technique is known as multi-lateralization, although it’s more commonly referred to as triangulation. Less than a minute after the gunfire occurs, ShotSpotter alerts local first responders like police.

ShotSpotter’s sensors can also reveal more than just a shoot- er’s position. Roughly half of all gunfire events consist of multiple shots, says Shown, in which case ShotSpotter’s sensors can compute both the velocity of the shooter and the direction he or she is moving. The police can use this informa- tion to decide how many vehicles to send to the scene, which can help keep officers safe.

ShotSpotter’s sensors were first installed in Redwood City, California. Today, the technol- ogy can be found in over 80 cities across the United States and several sites overseas. In 2016, the com- pany analyzed over 70,000 inci- dents of gunfire. The data reveal an alarming trend: citizens report roughly only 20% of the gunfire picked up by ShotSpotter sensors. People become accustomed to (two) shots, says Shown. It’s this accep- tance of violence that Shown and his team are trying to combat.

Shown and his colleagues have also used ShotSpotter technology to curb illegal poaching. In 2012, a team installed a dozen ShotSpotter acoustic sensors in South Africa’s Kruger National Park to hone in on gunsights fired by rhinoceros poachers. Rhinos are killed for their horns, which are prized in traditional Chinese medicine. One night, the system picked up two shots. Using the accurate location of the gunfire, local officials found a set of tracks that led them to the poachers.

One of ShotSpotter’s ongoing technological challenges in urban settings is that buildings can both block and refract sound waves, says Shown. “It’d be useful to get three- dimensional maps of cities to train our detection algorithm, he says.

The author is a freelance sci- ence writer in Portland, Oregon.

AI Makes Inroads in Physics

By Sophia Chen

2018 APS April Meeting, Columbus, Ohio — These days, artificial intelligence (AI) drives many aspects of our lives. It pow- ers Google and Facebook, and it’s even found a foothold in medicine to help doctors diagnose.

But despite its budding ubiquity everywhere else, AI has been a hard sell in physics.

Take Eliu Huerta of the University of Illinois at Urbana- Champaign, for example, who is part of a team of researchers that have created a Gravitational-Wave Observatory (LIGO) collaboration. It took Huerta and his colleagues “a year and a half of code” since the rest of the collaboration that AI could speed up LIGO’s analysis of gravitational wave candidates “It was a journey,” he told APS News. This February, Huerta and his graduate student, Daniel George, published a paper on their AI-based analysis.

People “do a bit of nausaying without asking questions,” says Brian Nord of Fermilab, who is part of a team that has used deep neu- ron networks, an AI technique, to identify new astronomical objects in telescopic data. Their AI algorithms demonstrate huge leaps in computa- tional efficiency, but physicists are wary of using them, he says, because their fundamental mecha- nisms are still largely unclear.

The skepticism is healthy,” says Nord. “But I think there’s dis- missal that comes with the skepti- cism. I would love for people to ask questions, hard ones. But some- times ... people just say, ‘I don’t believe you.’

”

At the 2018 APS April Meeting, several physicists armed with tangi- ble results, including Nord, Huerta, and George, made the case for AI in physics. “It’s harder to dismiss [AI] when you see the benefits it brings,” says Rohan Bhandari, a graduate student at the University of California, Santa Barbara who has developed a deep neural net- work for analyzing Large Hadron Collider (LHC) data.

Nord’s group is using AI to dis- cover gravitational lenses, mas- sive celestial objects--such as galaxies--whose gravity bends light. These objects leave signa- ture distortions in telescope images that AI can help identify.

Understanding those distortions could help answer questions about dark matter, dark energy, and the expansion of the universe.

Neural networks alleviate the tedium of conventional techniques used in the hunt for gravitational waves. “We just have a few seconds to determine if something’s still in front of our screens, and looked with our eyes through many, many hundreds of square degrees,” said Nord at an earlier conference on AI in physics research.

Huerta and George have developed a deep neural network to speed up LIGO’s signal identifica- tion process. For its first discover- ies, LIGO identified gravitational

L-R: Dylan Smith, U.S. Rep. Barbara Comstock (VA-10th), Michelle Lollie and Brian Zamarripa Roman were all smiles as they discussed the positive impact of the APS Bridge Program.

News from the APS Office of Government Affairs

On Capitol Hill, Students Exalt Value of APS Bridge Program

By Tanwanda Johnson

In 2009, Brian Zamarripa Roman found himself facing dif- ficult times. After discovering his passion for physics as a high school junior, his father suddenly passed away, leaving Zamarripa Roman to help his mother raise his three siblings while attending college at the University of Texas at El Paso.

“I had to work at Burger King and sell used car parts to help make ends meet for my family,” he recalled of his struggle. “I was in an engineering program and ended up with a D in the first design course. I switched my major to physics and excelled and went in search of a Ph.D. But when gradua- tion came around, I was distracted. I had missed the deadlines to apply for the [Graduate Record Exam] and for graduate schools.”

Zamarripa Roman and two other students who participate in the APS Bridge Program (APS-BP) recently shared their inspiring stories with members of Congress on Capitol Hill. They met with Rep. Barbara Comstock (VA-10th), Michelle Lollie (Mo), Brian Nord of Fermilab, who is part of a team that has used deep neural networks, an AI technique, to identify new astronomical objects in telescopic data. Their AI algorithms demonstrate huge leaps in computational efficiency, but physicists are wary of using them, he says, because their fundamental mechanisms are still largely unclear.

At the 2018 APS April Meeting, several physicists armed with tangible results, including Nord, Huerta, and George, made the case for AI in physics. “It’s harder to dismiss [AI] when you see the benefits it brings,” says Rohan Bhandari, a graduate student at the University of California, Santa Barbara who has developed a deep neural network to speed up LIGO’s signal identification process. For its first discoveries, LIGO identified gravitational
MORY continued from page 1
desired sensitivity in the right fre-
quency range, LISA will consist of three
AAPS April Meeting, but just
over a year ago, he attended a
conference on theoretical gravi-
tational wave modeling and was
overwhelmed. “The people there
talked about all these things that
sounded really interesting, but they
were using words and equations that
seemed so complex I didn’t think I
could ever begin to under-
stand them,” recalled Morye. “It
was intimidating, but at the same
time it was incredibly intrigu-
ing.”

Rather than allow the com-
plexities of studying gravitational
waves, black holes, and the uni-
verse to scare him off or postpone
his start in research, Morye dug
depth, voraciously reading text-
books and published papers on his
own projects.

That work paid off for Morye
and the 28 others who are part
of the same people present again,
and this time he understood almost
everything. “One of the coolest
things as a high school student that
I’ve experienced is going from
knowing nothing to knowing some-
thing,” said Morye. “I’m very far
from being even close to a lot of
the experts in my field, but it’s been
incredibly rewarding to go from
knowing nothing to knowing some-
thing beautiful and interesting the
work that’s being done in my field.”

The Tunguska remained.

This April Meeting was likely the first of many for Morye as he
continued his physics career. He will attend the Massachusetts
Institute of Technology in the fall and wants to go to graduate school.
However, before grade school, Morye also plans to spend a year
studying math and science through the Peace Corps to share his love
of physics with others. “I’ve been
lucky to get the opportunities that
I’ve had so I think it’s important
for me to give back to the world,”
said Morye. “In life, I want to
combine my love for physics with
something that helps other people achieve their goals or find
their passion.” And Morye already sees the importance of passion in
physics: He encourages other young researchers to seek out projects
that “really makes you want to get out of
bed every day because you want
to work on it,” because “physics
research can be really, really hard.”

Morye credits his early entrance
to physics research, and the success
he has already had in the field, to
support of his mentors, his school, and
his family and friends. “Whenever
I have victories in my research, whether
big or small, I think of myself and
those victories as the result of standing
on the shoulders of those who have
given me a leg up,” said Morye,
quoting Isaac Newton. “I’m
incredibly thankful for all those people
and for AAPS for providing me with
this amazing opportunity, to study
physics and learn more about
the world around me.”

TUNGUSKA continued from page 2

Like trajectory. A 2013 analysis
of fragments taken from the site,
along with studies of resin from
the explosion, determined that
the asteroid hypothesis comes from
a similar, but smaller, explosion
February 15, 2013, in the Ural dis-
Tristan of Russia, with a shock wave
powerful enough to also shatter
windows. Scientists determined
that event was caused by an aster-
oid spanning 17 to 20 meters in
diameter, with a mass of about
11,000 tons.

Further Reading:
Baxter, J. and Atkins, T.
2006. The Tunguska Fire-
bomb. Cambridge: Icon Books Ltd.

February 15, 2013, in the Ural dis-


Climate Change: Assessing the Environment in the Physics Workplace

By Leah Poffenberger

Promoting diversity in STEM
fields is a hot topic, but some
physicists see a lack of cool
reception in the workplace. That’s
the message of a new NSF-funded
survey of APS members released
by researchers at the University of
Michigan and Michigan State

By Robin Fox

APS News

In the correction on p. 3 of the May 2018 APS News, the description of the 1988 Nobel Prize in Physics erroneously stated that “the only Fermilab
laureate is Leon Lederman, for his work with Melvin Schwartz at the University of Chicago.” In fact, the laureates were Leon Lederman,
Melvin Schwartz, and C. V. Raman. “For the neutron beam method and
the demonstration of the doubling structure of the leptons through
the discovery of the muon neutrino.” As stated by the Nobel Foundation,
“the experiment was planned when the three researchers were
associated with Columbia University in New York, and carried out using
the Alternating Gradient Synchrotron (AGS) at Brookhaven National
Accelerator Laboratory on Long Island, U.S.A.” We apologize for the error.
How Big Is the Proton, Really?

By Sophia Chen

2018 APS April Meeting, Columbus, Ohio—In 2010, Randolph Pohl’s team measured the size of the proton with the highest precision yet. But the result befuddled them: the proton radius—or more specifically, how far its positive charge extends—came out to 0.84 fm, about 0.04 fm smaller than all prior measurements. The particle’s width seemed to have shrunk by 4 percent.

“It caught everybody off-guard,” said David Newell, who chairs the Committee on Data for Science and Technology (CODATA), the international group which publishes the recommended values for fundamental physical constants every four years.

To this day, physicists do not understand the source of this discrepancy. In a presentation at the April Meeting this year, Pohl, who works at the Johannes Gutenberg University in Mainz, Germany, said the results have only been reproduced by three other experiments for resolving the so-called proton radius puzzle.

Soon, George, they will use the neural network to help LIGO, its European counterpart Virgo, and conventional telescopes collaborate in real time. If LIGO or Virgo can identify and locate a gravitational wave quickly, they can then advise telescopes to observe the same location. These gravitational wave detections can then be paired with the images made with conventional optical telescopes to provide rich physical data about the event in this new era of “multi-messenger” astronomy.

AI can be applied to more than astronomy: Researchers have also begun to use AI to process particle collider data. Bhandari presented his work on a deep neural network for analyzing complicated signals from the Large Hadron Collider data. Bhandari presented his work on a deep neural network for analyzing complicated signals from the Large Hadron Collider data. Bhandari presented his work on a deep neural network for analyzing complicated signals from the Large Hadron Collider data. Bhandari presented his work on a deep neural network for analyzing complicated signals from the Large Hadron Collider data. Bhandari presented his work on a deep neural network for analyzing complicated signals from the Large Hadron Collider data.
The American Physical Society is conducting an international search for a new Lead Editor of Physical Review A. The Lead Editor will provide intellectual leadership and vision for editorial standards and policies, direct the journal, and lead its editorial board and staff of editors.

Physical Review A publishes important developments in the rapidly evolving areas of atomic, molecular, and optical (AMO) physics, quantum information, and related fundamental concepts.

The ideal candidate will possess the following qualifications: current involvement and stature in a field of research within the scope of Physical Review A; prior editorial service with scholarly journals; management experience; ability to work effectively with authors, referees, editors, and the APS; advocacy, integrity, and wisdom to lead the journal in responding to publication matters and issues important to all communities served by the journal.

The Lead Editor may maintain his/her present appointment and position while devoting about 20% of his/her time to this position. The initial appointment is for a three-year term with renewal possible after review. Compensation is negotiable and dependent on established time commitment. The desired starting date is 1 January 2020, but other arrangements can be made for outstanding candidates.

APS is an equal employment opportunity employer and encourages applications from and nominations of women and minorities. Review of applications will begin on 15 June 2018 and continue until a candidate is selected. Inquiries, nominations, and applications (cover letter plus CV) should be sent to: Prof. Anthony Stacy, Chair, PRA Search Committee, edseta@aps.org

All applications and nominations will be treated with strict confidentiality.

JOURNALs continued from page 1

ers, who are asked to explain a new result and why it matters. What were the researchers after? What special thing did they do that was succe
er? What can the field do with this result?

This method of highlighting papers isn’t unique—journals like Science and Nature have been doing it for decades. What gives Physics its own flavor is that the stories are culled from the Physical Review journals, which publish incredibly diverse research. There are the big topics—like topologi
cal phases, quantum computing, and dark matter searches. But there are also surprising and quirky stud
es, the highlights of local exper
tial markets, experiments that yield laundry advice, tricks with Bose-Einstein condensates, or a “macroscopicity scale” that ranks a quantum superposition of cats as a 57.

Physics has evolved since its launch. Initially, it featured only expert commentaries known as Viewpoints or editor-written summa
taries called Synopses. But today we have our logo, review-style articles, or “Trends.” In 2011, Physical Review Focus, a pioneering website that had fea
tured physics stories written by journalists since 1998, was incor
toporated into Physics as a section called Focus. And in 2012 we used our knowledge of interesting papers to issue a weekly “tip sheet” of top stories to journalists.

Mining the pages of the Physical Review journals has given us no end of great stories. But physics is more than papers, and we want the publication to reflect the people, debates, and events behind the reported research. Physics therefore regularly features interviews with physicists, news stories from conferences, and pieces about the influence of physics in the arts, and the publication will continue to grow in volume and diversity in the coming years.

A question we are often asked is how we decide which papers to cover. For ideas, credit largely goes to the editors of the Physical Review journals who suggest recently accepted papers and explain why the results matter. We complement these suggestions by keeping a close eye on the journals.

We are also fortunate to have a bank of international experts who give input—either from the review process or from an email or phone call—and help us make a decision. Some results—such as the discov
ery of a new atomic element and the first detection of gravitational waves—are obvious choices. But science is usually more increment
el, pushing forward in fits and starts. So when considering a paper we ask: what is the scientific advance and how influential is it likely to be?

We also leave room for results that are simply fun, weird, or curious. But in all cases, we ask the same question: Will physicists appreciate a tale about this paper even if they have nothing about the topic?

To that, one might ask: Is it worth trying to explain the latest result from CERN to a condensed matter physicist? Or ever to incorporate into a new spin liquid to a cosmo
gist? We think so. At the end of the day, all physicists are trying to understand how the world works, reining it in with a little bit (or a lot) of math. Sharing their discover
es—big or small—is a reminder of this unifying truth.

As Physics editors, we’ve had front-row seats to many great findings over the last 10 years and we’re looking forward to more of the same in the next decade. So, thank you to all of the storytell
ers—the science writers, editors, and, at last count, the nearly 800 scientists who have contributed their time to explaining research.

Jessica Thomas is the Editor of Physics (physics.aps.org)

If you are interested in receiving the weekly Physics newsletter, go to “Email Alerts” on physics.aps.org.

PRoNTO contiNued from page 5

crepancy might vanish by introduc
ing new particles, but the options are “very artificial,” he says.

The discrepancy is simply the result of experimental error, according to Pohl. The strategy now is to make more proton radius measurements, but with different techniques. This way, each measurement will not suffer from the same systematic uncertainties—and collectively, any hint of new physics will be more convincing.

Researchers have a variety of techniques to choose from. First, they need to decide which proton-containing specimen they want to use for their measurement. Generally, they need to use a sys
tem simple enough for theory to model precisely. The simplest system is hydrogen, but they can also use its isotope deuterium, whose nucleus consists of an additional neutron. Or, they can substitute a muon for the electron in these systems.

In addition to muonic hydrogen, Pohl’s group has also measured the proton via muonic deuterium: a muon orbiting a neutron. According to Pachucki, this system is just as simple enough for theory to model, although it suffers from the same systematic uncertainties as muonic hydrogen.

Experiments with muonic deuterium: a muon orbiting a neutron offer exquisite precision. “It’s really fun stuff,” says Pohl. “You learn something new every day.” But this level of detail also meant that Pohl took his collaboration about ten years to deliver their 2010 measurement.

Rather than勇敢ly assuming a measurement for the proton radius value, which is an average of many prior experiments, did not incorpo
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Researchers have a variety of techniques to choose from. First, they need to decide which proton-containing specimen they want to use for their measurement. Generally, they need to use a sys
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In addition to muonic hydrogen, Pohl’s group has also measured the proton via muonic deuterium: a muon orbiting a neutron. According to Pachucki, this system is just as simple enough for theory to model, although it suffers from the same systematic uncertainties as muonic hydrogen.

Experiments with muonic deuterium: a muon orbiting a neutron offer exquisite precision. “It’s really fun stuff,” says Pohl. “You learn something new every day.” But this level of detail also meant that Pohl took his collaboration about ten years to deliver their 2010 measurement.

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and seeds. The cost of maintain-
ing their livelihood overtakes any profits gained, and more than 50% of livelihoods in India depend on agriculture.

AID’s work to support farmers and their families, to teach organic farming practices, and bring in sustainable technology is only one among the many projects of the organization. The goal of restoring caste parity remains at the forefront of the organization.

“We were connecting the privi-
leged class with the underprivi-
leged,” Kubra has been quoted as saying. "If we made that connection, something beautiful would emerge.”

Behind the walls

On the northern end of Tehran, a wall runs the length of a street where casual passers-by go about their daily business. In one place, a blue sign is painted in Persian and English: “Evin House of Detention.” Behind this wall, physicist Narges Mohammadi has spent more than 1000 days.

The road to Mohammadi’s imprisonment begins with two appointments to her time as a gradu-
ate student at Imam Khomeini International University. While studying physics, she founded the student organization “Illuminating Student Group.” The student orga-
nization worked to shed light on complex issues, including those of human rights.

Mohammadi describes the motivation for starting her human rights work to her open letter: “I felt compelled to join the struggle for freedom. What we experience is a decades-old tyranny, that cannot tolerate freedom of speech and thought. In the name of religion, it restricts and punishes science, intellect, and even love. It labels as non-human, evil and toxic to society whatever is not compatible with its political and economic interests.”

It considers punishing unwelcome ideas as a positive thing.”

In 2003 Mohammadi joined the Defenders of Human Rights Center (DHRC), an organization founded by five lawyers, including Nobel Peace Prize recipient Shirin Ebadi. She later became the vice presi-
dent and a spokeswoman of the organization. In 2008 government representatives raided the offices of the DHRC and officially shut down the organization.

In 2009, she was arrested a third time for her involve-
ment with the DHRC. After just a few days out on bail, she was arrested again and this time sen-
tenced to 14 years in prison. This sentence would be reduced to 10 years only to be increased to 16 years in May 2016.

From behind the walls of Evin Prison, Mohammadi describes the treatment of political prisoners. She writes, “They use ‘white torture’ on political prisoners: keeping sus-
psects in solitary confinement is a routine and prevalent procedure. They confine a human being, alone, to a tiny cell for an unlimited and indefinite period of time, in a small space without light or proper air, where there is no sound, smell or movement.”

“The statement contin-
ues to describe verbal and physical abuse, forced medications, sleep deprivation, and many other things to induce fear.

During her time in Evin Prison, Mohammadi’s health has been in decline. Her imprisonment has been punctuated by periodic releases for treatment. Her most recent release in October 2015 ended after just 17 days when she was taken back into custody against medical advice. An appeal for her release in September 2016 resulted in the 16-year sen-
tence being upheld.

Mohammadi writes, “I will not be silent in the face of human rights violations. In order to institutional-
ize human rights and achieve peace between the people and the state, I shall endure my deprivation of freedom and rights, even though separation from my children is nothing less than death for me.”

At this point while reading, Tohidi’s voice filled with emotion. She paused to steady herself before continuing with Mohammadi’s let-
ter. “I am a woman and a mother, and with all my feminine and maternal sensibilities, I seek a world free from violence and injus-
tice, even if I have suffered injus-
tice and violence tens of times.”

Though Mohammadi is impris-
oned, the news of her arrest reached her. As Tohidi and others who know her point out, knowing she received the award has given Mohammadi’s strength and provides a sense of solidarity.

“Sitting here in prison,” Mahvash Kuchimanchi con-
cludes, “I am deeply humbled by the honor you have bestowed on me and I will continue my efforts until we achieve peace, tolerance for plurality of views, and human rights.”

Taking action

Shelly Lesher, chair of the Committee on International Freedom of Scientists (CIFS), con-
cluded the session, eliciting equal applause. Upon her induction into physics, the APS stamp of approval

right after delivering her talk, in recognition of her efforts to promote human rights. “I am deeply humbled by the honor you have bestowed on me and I will continue my efforts until we achieve peace, tolerance for plurality of views, and human rights.”

Proposals for innovative public outreach projects come to the selec-
tion committee from many differ-
ent groups, from national labs to universities to independent science outreach groups—but applicants don’t have to be outreach experts to get funds to try something new. Students at the University of Waterloo were responsible for one popular and incredibly successful event called Light at the Museum.

The APS Sakharov Prize was awarded to Narges Mohammadi, who is impris-
oned in Iran. Nayereh Tohidi accepted the prize from 2018 APS President Roger Falcone on behalf of Mohammadi.

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made the cut.

Two of the selection commit-
tee’s favorite proposals will take particle physics into places people might not expect: state parks and libraries. One winning team will take muon detectors to Letchworth State Park in New York, allow-
ng visitors to learn about cosmic ray muons and discover how the number of muons reaching Earth changes at different areas of the park. “State parks already have a lot of science in them, like envi-
ronmental science or biology,” says Thompson. “This project will bring physics to an informal educational space that doesn’t usually have much science.”

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A Life in Teaching and Turbulence

By Katepalli R. Sreenivasan

Most of you are younger than me—some, a lot younger. So perhaps you won’t dismiss me entirely when I make three points on my own conduct.

• The first is that, for many years now, I have tried not to be the smartest person in the room. I admit that I may have tried to be so at one time, and may have succeeded at various levels, but it became clear to me that I wasn’t learning much by being so. This change in outlook was not hard to come by because it was becoming intrinsically truer as time advanced but it took some modest practice. My most intellectual foothills have been those in which I was overtly aggressive.

• The second is that some 25 years ago, I resolved that if anyone wishes to talk to me about their careers or personal lives, I would give them the most honest advice I can and support them in the best way possible. The lower in hierarchy they are, the more attention they deserve. I have said no to meetings with visiting vice chancellors and ambassadors if an undergraduate in distress wanted to see me urgently. My criterion has never been the importance of the person in question but her or his needs. Even if the problem vexing the person may be generic, it is special to her or him—and I have tried to remember that as well as I can.

• Third, I have been fortunate that several opportunities have come to me in my life—some of which include higher positions than those I ended up holding. I have remained faithful to a personal system of making choices by always asking two questions, (a) Is it worth doing; and (b) am I the best person for doing it? The answer to (a) involves a value system built into oneself; so perhaps you would come to a different conclusion on what may be worthy. I have no quarrel with that, but urge you to contemplate quietly when you are faced with choices and decide to pursue one actively. My own choices had no relation to the importance of the job, or the money or prestige it brought, or even to the inconvenience that the job caused me and—I am somewhat embarrassed to admit—even to my family. The answer to (b) requires an understanding of one’s own strengths and weaknesses. This, in turn, requires life-long introspection, which all of us should practice: It is equally unsatisfactory whether we overstate our strengths or understate them.

Let me now say a few words about turbulence as a field of research. I want to add a few comments on the dynamics of how the community would like to work together—to make progress. I embed a few words of advice to the younger participants.

Turbulence consists of a number of fascinating problems (and is not just one “unsolved problem in classical physics”). The precise problem on which each one of us works depends on:

• one’s natural and acquired tastes;
• financial support one generates;
• one’s own abilities and skills;
• the extent to which one is willing to interact with and learn from others;
• one’s environment; etc.

I will particularly make a few remarks on how to increase the visibility of the field; each of us benefits if our chosen field thrives. One set of my remarks deals with internal dynamics of the community and the other concerns external perception.

Internally, we hear complaints that: (a) there isn’t enough recognition comes even of high impact factor or be impressed by grant dollars someone generates.

b. We should not fragment ourselves. One shouldn’t think that all those who work on problems other than one’s own are wasting time and resources. Even if you are a practically oriented person (as most of us are), you should show a certain amount of active generosity of spirit towards those who seriously want to understand something different. It is true that you may not have enough resources to do everything, and so we have to build some consensus on the most profitable directions, but this does not come by one conversation in a meeting: “I know a smart person...” comes from a sense of mutual respect and generosity of spirit that prevails in the background; it comes from an environment that the established people have to create in order to ensure that new people with new ideas feel secure and appreciated. This means that all of us must spend modest amounts of time in dialogues with each other instead of dismissing those with different views off-handedly: these means that we have to listen to both bright and intelligent voices instead of succumbing to those few who are habitually pushy or counting papers in journals of high impact factor or be impressed by grant dollars someone generates.

c. I would like to say a few words about our reputation as a tough community: many internal battles that were fought in the past have meant very little in hindsight but have ruined interpersonal relationships and diminished all those involved. This aggression occurs really because some people think that we are all part of a zero-sum game. First of all, you should not accept this premise; indeed, most successful people have never been limited by this fallacy. Second, please give full credit to the guy that went before you; don’t make it sound like you have reinvented the wheel. Cite other people’s work in your talks; be generous towards their contri-

Another problem is that many communities who use turbulence as part of their bread and butter work are indif-

Many of you may think that quantum mechanics has nothing to do with continuum fluids (and that would be real short-sighted). In this respect, I am strongly in favor of a broader education for our graduate students, including, as examples, physics, biology, statistical mechanics and artificial intelligence. Accommodating a few basic courses in a few of these subjects, instead of adding another specialized course in fluid mechanics, is well worth the effort. I like think we should publish occasionally in broader journals, instead of crowding towards one or two top journals in your narrow specialization, because the very task of explaining to a wider audience enlarges one’s perspective.

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