Robert Rosner, 2023 APS President, Takes the Helm

BY TARYN MACKINNEY

Robert Rosner likes big questions.

"How can nuclear power help humanity in a warming climate? How can physicists better explain their work to the public? And why are magnetic fields... well, everywhere?" The nerve of them, being so ubiquitous," he says.

Rosner is an eminent theoretical physicist and the 2023 APS President, and his love for the field stretches back to childhood. "I loved puzzles; I always read science articles, books," he says. He earned his bachelor's degree in physics from Brandeis and his doctorate from Harvard and has been at the University of Chicago since 1987.

Rosner's research focuses on fluid dynamics, plasma physics, and computational physics, but energy issues — both science and policy — seem large, too. "Why do I care? That's simple: climate change," he says.

Rosner spoke with APS News about his background and the challenges and opportunities that lie ahead for APS and physics. This interview has been edited for brevity and clarity.

What first got you into physics?

I don't remember a time when I didn't love science. When I was a kid, Robert Rosner Credit University of Chicago

The 2022 Physics Laureates Share Their Stories in Stockholm

As the Nobel Prize returns to ‘real life,’ quantum physicists challenge our view of reality.

BY ARIGAIL DOVE

On a frigid December morning in Stockholm, hundreds of people gathered in lines,queuing up for a unique Swedish ritual. The human airway. Credit Anatomy Insider

"Conscience," a Nobel Prize-inspired light display, brightens Stockholm's City Hall in December 2022. Credit: Studio Ender

The 2022 Physics Laureates Share Their Stories in Stockholm

Quantum mechanics long predicted entanglement, but its counterintuitive nature left many physicists baffled — including Albert Einstein, who famously dismissed it as "spooky action at a distance." It was only after experimental evidence from the physics laureates Alain Aspect (École Polytechnique), John Clauser (Lawrence Livermore/ Berkeley), and Anton Zeilinger (University of Vienna) that quantum entanglement was accepted, fundamentally changing our understanding of nature and seeding fields like quantum information science.

On Dec. 8, in a packed auditorium at Stockholm University, Aspect, Clauser, and Zellinger each took the stage to tell their stories. Clauser is credited with performing the first experimental tests of quantum entanglement. In 1972, Clauser, then a cash-strapped postdoc, hobbled together an unwieldy apparatus that spat out pairs of photons. Clauser recalled that he and his colleagues had set out to find "hidden variables," theorized traits of particles that would make entanglement more intuitive and less spooky but that were incompatible with quantum mechanics.

Instead, Clauser's experiments showed that hidden variables, favored by Einstein, could not explain the behavior of entangled particles. "Our experiment was a test of Einstein's whole platform for doing physics, and we effectively put him out of business," Clauser explained. "The idea of hidden variables was dead on arrival." Next, physicists had to eliminate other loopholes that could explain the connection between entangled photons. Almost a decade after Clauser's experiment, Aspect developed a more sophisticated experimental apparatus that emitted

The Society hasn't held a major meeting in Las Vegas since 1996, when 4,000 physicists flocked to the iconic MGM Grand Hotel. Additionally, the casinos suffered one of their worst weekends ever; the physicists avoided gambling like the plague, instead cramming into conference talks, according to Quartz. In a cheeky 2013 Letter to the Editor of APS News, Marvin Co

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Making a Beef Patty — Without the Beef

Meet Dr. Huan Yan, a chemical physicist at the plant-based meat company Impossible Foods.

BY ALAINA L. LEVINE

When Impossible Foods launched in 2013, the company’s mission was “to restore biodiversity and reduce the impact of climate change by transforming the global food system” — no small task. But in the dozen years since, the start-up did what they thought was indeed possible, developing tasty, nutritious, and more sustainable meat, dairy, and fish alternatives that were only bees or critters involved.

To succeed, Impossible Foods needed to attract bright scientists from a wide array of stripes, including biologists, chemists, materials scientists, and plant scientists, to team up and scrutinize why meat looks, feels, and tastes like meat. Yan says, “The company’s mission struck a chord with me and it was the first company I really wanted to work at.” Yan says, “The company’s mission struck a chord with me and it was the first company I really wanted to work at.”

Yan joined Impossible Foods in 2015, first dabbled in chemical physics from Kent State University, and in 2018 she became the company’s Director of Research and Development and its first female scientist. “And in the end, I got the offer.”

“For Yan, workplace ethos is only part of Impossible’s Food appeal,” she says. “The company’s mission to create a more sustainable food system — no small task. But in the dozen years since, the start-up did what they thought was indeed possible, developing tasty, nutritious, and more sustainable meat, dairy, and fish alternatives that were only bees or critters involved.”

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“When I was in school, I wasn’t thinking about what I wanted to do. I was just thinking, ‘Okay, let me just get a job and make a living,’” Yan says. “But now, she says, “the work has a sense of mission-driven.”

That’s because animal agriculture uses 30% to 50% of Earth’s ice-free land and about a third of all freshwater, and the livestock sector produces at least a seventh of greenhouse gas emissions, according to the United Nations Climate secretariat — a problem that Impossible Foods aims to help fix.

“Being able to make delicious, nutritious meat from plants is actually helpful for the environment,” Yan says.

B

B efore John Glenn, Neil Armstrong, or Sally Ride stepped into a spacecraft and rocketed into the annals of history, an impossibly thick bunch of fruit flies had to pave the way.

Of the flies, the V-2 rocket’s first test flight, the flies’ flight traces to the summer of 1945, when a load of Germanmade V-2 rocket parts arrived at White Sands, a newly established military testing area that is almost as isolated as a valley of the moon, which it resembles,” writes Lloyd Mallan in Men, Rockets and Space Arrs, an on-the-ground chronicle of early spaceflight efforts published in 1959. The U.S. also imported a group of scientists and engineers from postwar Germany to assist with experiments using the V-2s, part of the intelligence operation later known as Operation Paperclip.

Standing 46 feet tall, weighing 28,000 pounds, and equipped with a nuclear bomb, the V-2 rocket was the world’s first long-range ballistic missile. As the war ended, both the Soviet Union and the U.S. scrambled to capture V-2 technology and know-how for study and missile development.

By development, this fruit fly (Drosophila melanogaster) had become a star player in genetic and biomedical research. Kitchen propitators know them well as the pests that linger around overripe bananas, but for scientists looking for an inexhaustible model organism, fruit flies are a dream. They can be easily cultured and maintained in small lab spaces; they develop from embryo to adult in about ten days; (and) they reproduce by the thousands,” writes Harvard University biologist Stephanie Vehrencamp in First in Fly: Drosophila Research and Biological Discovery. Beyond their ubiquity and usefulness, fruit flies have simple genomes with only four chromosome pairs, yet are quite like humans in how their traits are inherited, genes are expressed, and cells work. Some estimates conclude that nearly 75% of all disease-causing genes known in humans are also found in fruit flies, and to date, at least five Nobel Prizes in Physiology or Medicine have been awarded for research done in the tiny insects.

The second of those five was awarded in 1964, only a few months before the flies’ ride on the V-2, to geneticist Hermann Joseph Muller for “the discovery of the production of mutations by means of x-ray rara.” To a series of experiments in 1926 and 1927, Muller found that bombarding flies with x-rays induced mutations in their genes, par

When V-2 work began at White Sands, a group of scientists quickly recognized the missiles’ potential for space research, and in early 1946, a panel there began fielding proposals from civilian engineers and researchers. It quickly approached and was soon contacted by scientists from Harvard and the U.S. Naval Research Laboratory to launch fruit flies and corn seeds on a rocket.

Up they went on Feb. 20, 1947. The flies reached an altitude of 109 kilometers in 190 seconds (space starts at 100 kilometers, according to NASA), then parachuted back down to Earth, where they were recovered alive and examined by biologists. “Analysis made by Harvard on recovered seeds and flies has shown that no detectable changes are produced by the radiation,” wrote U.S. Naval Research Laboratory nuclear physicist Ernst H. Krause in a report published that same year.

“We’re looking at proteins and small molecules, profiling the nutritional analysis and the chemistries or physical properties behind (animal meat) to see if we can recreate all that,” Yan says. “That’s very interesting and a scientific problem for us to solve.”

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“After you stare enough fruit flies straight in the eye, you start to have hallucinations. I’m beginning to think I can see their eyelashes,” Simons said.

In the years after, a parade of rodents, monkeys, dogs, cats, and other animals were launched into space to further study the effects of radiation and other phenom

Can you guess what this burger doesn’t have? Animal meat.

Credit: Impossible Foods

Impossible Foods continued on page 11

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Honeybees are among the most important pollinators of the world’s agricultural crops. About a third of the food in our diet relies at least partially on these insects, and they’re estimated to contribute around $12 billion to the United States economy alone.

“Bees are natural pollinators and important to the environment,” says Bardia Hejazi, a physicist at the Max Planck Institute for Dynamics and Self-Organization in Germany. “It’s impossible to understand how they behave, how they manage to maneuver through different environments.”

Hejazi had always been interested in combing physics and animal studies, so when his institution procured three Carniolan honeybee hives, he jumped on the opportunity to study them. With a backdrop in turbulence research, he decided to study how honeybees fly in wintry conditions — a question that could someday assist in the design of small flying robots.

At the 2022 APS Division of Fluid Dynamics meeting in Indianapolis, Indiana, in November, Hejazi discussed findings from research published in the New Journal of Physics. He found that bees’ average velocity didn’t seem to be affected by the wind — not what you’d expect from a small insect battling strong gales.

“If you, for example, are walking headwind, you’re slower, you’re fighting against the wind, right? And maybe your velocity is less because of that,” Hejazi says. Or the opposite could be true. If you’re riding a bicycle downhill, you’re probably going faster.

“But the bees are maintaining that average velocity, regardless of the wind,” Hejazi explains.

Fernand Torres-Davila was five years old when he first saw the world clearly. With thick lenses in his new glasses, he gazed up and spotted individual stars.

Torres-Davila was amazed not just by what he saw, but by how the world looked from his “fresh point of view,” but by the fact that a seemingly simple innovation — curved glass fitted in a frame — could have such a major impact. This, he says, sparked his early interest in science, an interest that would eventually lead him to enroll in an APS Bridge Program at the University of Central Florida (UCF) to pursue graduate studies in physics and, afterward, land a job as a Honeywell engineer.

Growing up in Puerto Rico, Torres-Davila was drawn to astronomy because of the stunning night sky, he says. Then, in high school, he took a physics class. “My teacher was eccentric — very passionate about the field,” he says. “It was a very fun class.” Torres-Davila realized that he wanted to follow the broad field of physics, not just astronomy. Around the same time, he developed an interest in engineering, robotics, and chemistry; picking one would be tough.

When it came time to plan for college, Torres-Davila made a list of “must-haves.” It included good physics textbooks, classes covering homework assignments were in Spanish — typical for undergraduate science courses in Puerto Rico, he says.

As the semesters progressed, Torres-Davila’s adviser, Luis G. Rosa, became one of his champions. Rosa guided him toward research experiences, first at UPRH, funded through the NIH REU program, and then at the University of Nebraska–Lincoln.

In 2011, the summer before starting his undergraduate studies, Torres-Davila enrolled in advanced math courses, which catapulted him ahead in his first year of college. Once at UCF, he chose a dual major in the Physics Applied to Electronics program, which allowed him to combine his interests.

His science classes used English textbooks, but class conversation and homework assignments were in Spanish — typical for undergraduate science courses in Puerto Rico, he says.

Fernand Torres-Davila

With three different images of the same bee, the researchers used computer codes to track its path in three dimensions. The team then used this data to calculate the best velocity and acceleration.

They found that the bee’s average velocity didn’t seem to be affected by the wind — not what you’d expect from a small insect battling strong gales. The researchers compared them to a no-wind baseline. To see the bees fly in the right direction, they assembled screens on either side of the hive. A fence, bordered with trees and bushes, served as a natural barrier on the opposite side of the hive. To film the bees flying, the team set up three GoPro cameras in the experiment area, each placed at a different angle.

Fernand Torres-Davila

In these experiments, the sensor is only in the rabbits’ airways for a few minutes at a time. “Right now, it’s more about testing how you would actually install this,” Fitzgerald explains. In the future, the team hopes their work will help lead to a sensor in humans that allows for long-term monitoring.

“Oftentimes, for [chronic respiratory] conditions, you have to have multiple doctor’s visits where sometimes they just put a scope down and see if you’re breathing good,” Fitzgerald says. “If you had more continuous monitoring, you might be able to detect earlier stages.”

☆ Tessa Jones is a science journalist based in Madison, Wisconsin.
U.S. Science Budgets for 2023 Fall Short of CHIPS Act Ambitions

BY MITCH AMBROSE

The final days of 2022, and after a months-long stalemate, Congress passed legislation that will raise the budgets of federal agencies for the rest of fiscal year 2023. Most science agencies will receive increases that keep pace with inflation; a few will see double-digit percentage boosts.

However, these increases fall short of the ambitious targets Congress set in mid-2022 through the CHIPS and Science Act, which recommended ramping up budgets for three agencies—the National Science Foundation (NSF), the Department of Energy’s (DOE) Office of Science, and the National Institute of Standards and Technology (NIST). The act did have some influence: Congress gave the NSF $1 billion extra via a special supplemental appropriation. In absolute terms, it’s the largest increase the agency has ever received. The supplement also includes nearly a half billion dollars to launch a set of regional hubs for technology development that the Act authorizes.

The supplement increases the NSF’s total budget by 12%, to $9.9 billion, for this fiscal year. But the CHIPS and Science Act recommended a 35% increase, with the aim of more than doubling the agency’s budget over five years.

The supplement gave lawmakers a convenient way to boost science funding, because that money does not count against the agreed-upon limits on overall federal spending. But to sustain the elevated funding in future years, lawmakers will need to either make cuts to other agencies’ ordinary budgets or broker new supplements. That task may prove difficult with a new Republican majority in the House of Representatives, which aims to curb federal spending.

The budget for the DOE Office of Science is rising 8% to $8.1 billion, more than double the increase the House had sought in the CHIPS and Science Act. However, the office just received a one-time boost of $1.55 billion for infrastructure projects via the Inflation Reduction Act, which Democrats passed this summer with no Republican support. Much of this extra money will help accelerate the construction schedules of major projects already underway.

The NIST’s budget is jumping 32% to $1.6 billion, though about half of the extra money is going to “earmarks,” projects outside the agency that are directly selected by lawmakers. Congress revived earmarking last year with bipartisan support after a decade-long moratorium. Many of the earmarks in the NIST budget are not related to the agency’s mission, instead going to upgrades at universities in lawmakers’ home districts.

Excluding earmarks, NIST’s budget is increasing by 18% — a meaningful bump, but far short of the nearly 50% increase proposed in the CHIPS and Science Act.

The NIST is also responsible for stewarding a $50 billion initiative to shore up the U.S. semiconductor industry, money that the CHIPS and Science Act guarantees — unlike budget targets for agencies, which the Act only recommends. For this year, the NIST budget is receiving an initial $7 billion installment from the Act, which it must juggle alongside the money it receives through the ordinary budget process.

Congressional attention will soon turn to the federal budget for fiscal year 2024, which begins on Oct. 1. President Biden is expected to submit his 2024 budget proposal to Congress in early February and he is likely to use the CHIPS and Science Act as a guidepost for his science proposals.

Mitch Ambrose is Director of FYI. Published by the American Institute of Physics since 1989, FYI is a trusted source of science policy news. Sign up for FYI emails at aip.org/fyi.

Task Force Gets to Work Reviewing APS Committees

A PS has long relied on standing committees to provide expert advice to it, on a wide range of topics relevant to the physics community. Currently, 26 committees — composed of APS members — advise the Board of Directors and Council on diverse areas, from ethics to education, public affairs to honor policies. Over the next 18 months, the task force will work over the next 18 months and report to the Board and Council.

Recently, the APS Board of Di-

rectors established a task force, chaired by Peter Schiffer, to assess the committees and recommend improvements. The task force will review the committees’ structures and operations, inform policy and processes, and experiences of committee members and the staff who support them. The task force will meet once or twice a month and will return with recommendations.

“‘Our experiment was a test of Einstein’s whole platform for doing physics, and we effectively were putting him out of business,’ Clauser explained.

John Clauser giving his Nobel lecture. Credit: © Nobel Prize Outreach, Picture: Anna Bengtsson.
APS Special Issue

APS 2022-23 Prizes & Awards

APS congratulates all prize and award recipients. Recipients will be honored at APS meetings throughout the year, and each will be invited to give a talk at the meeting where they receive their prize or award. For the full schedule of APS meetings, visit aps.org/meeting.

**APS Medal for Exceptional Achievement in Research**
Sidney Nagel, University of Chicago
For incisive experiments, numerical simulations and concepts that have expanded and unified soft matter physics.

**Abraham Pais Prize for History of Physics**
Jürgen Renn, Max Planck Institute for the History of Science
For contributions to the historiography of modern and early modern science, in particular studies of Albert Einstein; and for contributing scholarship and taking public stances that directly raise the social relevance of science historiography.

**Aneesur Rahman Prize for Computational Physics**
Pablo G. Debenedetti, Princeton University
For seminal contributions to the science of supercooled liquids and glasses, water, and aqueous solutions, through ground-breaking simulations.

**Arthur L. Schawlow Prize in Laser Science**
Demetrios Christodoulides, University of Central Florida
For pioneering several areas in laser sciences, among them, the fields of parity-time non-Hermitian optics, accelerating Airy waves, and discrete solitons in periodic media.

**Dannie Heineman Prize for Mathematical Physics**
Nikita Nekrasov, State University of New York, Stony Brook
For the elegant application of powerful mathematical techniques to extract results for quantum field theories, as well as shedding light on integrable systems and non-commutative geometry.

**David Adler Lectureship Award in the Field of Materials Physics**
Elbio Dagotto, University of Tennessee, Knoxville
For pioneering work on the theoretical framework of correlated electron systems and describing their importance through elegant written and oral communications.

**Davison-Germer Prize in Atomic or Surface Physics**
Feng Liu, University of Utah
For elucidating the influence of strain on epitaxy and nanostructure growth, and using these concepts to predict surface-based topological-insulator materials.

**Dwight Nicholson Medal for Outreach**
Chandralekha Singh, University of Pittsburgh
For work in broadening access to physics through research and removing barriers to success in the field faced by marginalized groups and how to overcome them, by addressing those challenges directly through meaningful, research-based action.

**Earle K. Plyler Prize for Molecular Spectroscopy & Dynamics**
Xiaoyang Zhu, Columbia University
For seminal research in the spectroscopy and dynamics of molecular condensed materials.

**Early Career Award for Soft Matter Research**
Pierre-Thomas Brun, Princeton University
For creative and groundbreaking contributions in developing soft functional materials using mechanical and hydrodynamic instabilities, elasticity and flow, from bubble casting for soft robotics to pendant drops coated on the underside of a substrate.

**Edward A. Bouchet Award**
Carlos R. Ordonez, University of Houston
For outstanding and impactful seminal research in different areas of physics and, in parallel, for being a dedicated advocate for advancement in physics in Latin America and in the Hispanic Community in the USA.

**Einstein Prize**
Gary T. Horowitz, University of California, Santa Barbara
For fundamental contributions to classical gravity and gravitational aspects of string theory.

**Excellence in Physics Education Award**
For developing an active, inclusive, and supportive community of physics educators dedicated to integrating computation into their instruction; creating, reviewing, and disseminating instructional materials; and generating knowledge of computation in physics curricula and of effective practices.

Marcos Caballero, Michigan State University
Norman Chonacky, Yale University
Larry Engelhardt, Francis Marion University
Robert C. Hilborn, American Association of Physics Teachers
Marie Lopez del Puerto, University of St. Thomas (Minnesota)
Kelly Roos, Bradley University

**Fluid Dynamics Prize**
Elisabeth Charlaix, Universite Grenoble Alpes
For a groundbreaking exploration of the liquid-solid interface leading in particular to a quantitative understanding of the Navier slip condition, based on an exquisite surface force apparatus developed for this purpose.

**TEAM AWARD**

**APS Special Issue**

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Francis M. Pipkin Award  
Andrew Geraci  
Northwestern University  
For developing new precision measurement techniques to search for weakly coupled interactions of mesoscopic range and demonstrating the precision sensing capability of optically levitated nanoparticles.

George E. Duvall Shock Compression Science Award  
Bruce Remington  
Lawrence Livermore National Laboratory  
For pioneering laser-driven high-pressure, solid-state material dynamics in high-energy density regimes.

George E. Valley Jr., Prize  
Lina Necib  
Massachusetts Institute of Technology  
For the discovery of a massive, previously unknown stellar structure that may have shaped the history of the Milky Way, and the development of groundbreaking new methods to study our Galaxy’s dark matter halo and growth history.

Hans A. Bethe Prize  
Frank Calaprice  
Princeton University  
For pioneering work on large-scale ultra-low-background detectors, specifically Borexino, measuring the complete spectroscopy of solar neutrinos, culminating in observation of CNO neutrinos, thus experimentally proving operation of all the nuclear-energy driving reactions of stellar evolution.

Henry Primakoff Award for Early-Career Particle Physics  
Bernhard Mistlberger  
SLAC National Accelerator Laboratory  
For groundbreaking contributions to high-precision quantum field theory, including the next-to-next-to-leading order QCD corrections to the production of Higgs and electroweak vector bosons at hadron colliders.

Herbert P. Broida Award  
Lai-Sheng Wang  
Brown University  
For pioneering work in characterizing solution species in the gas phase using high-resolution photoelectron imaging of cryogenically-cooled anions, and outstanding contributions in the investigation of size-selected boron clusters.

Herman Feshbach Prize in Theoretical Nuclear Physics  
Michael Ramsey-Musolf  
University of Massachusetts, Amherst and Shanghai Jiao Tong University  
For seminal contributions in precision electroweak studies of nuclear and hadronic systems, making fundamental symmetry experiments powerful probes of strong interactions and new physics.

I.I. Rabi Prize in Atomic, Molecular, and Optical Physics  
Adam M. Kaufman  
JILA  
For seminal developments in optical tweezer arrays and clocks based on alkaline earth atoms, with applications to metrology and quantum information processing.

Irving Langmuir Award in Chemical Physics  
Valeria Molinero  
University of Utah  
For seminal contributions in understanding the crystallization of water and heterogeneous nucleation.

Irwin Oppenheim Award  
Wylie Ahmed  
California State University, Fullerton  
For elucidating the stochastic force dynamics of a model biological micro-swimmer using an innovative combination of direct model-independent force measurement, simulation, and analytical modeling.

J. J. Sakurai Prize for Theoretical Particle Physics  
Heinrich Leutwyler  
University of Bern, Switzerland  
For fundamental contributions to the effective field theory of pions at low energies, and for proposing that the gluon is a color octet.

James C. McGroddy Prize for New Materials  
James Hone  
Columbia University  
Takashi Taniguchi  
National Institute for Materials Science  
Emanuel Tutuc  
The University of Texas at Austin  
Kenji Watanabe  
National Institute for Materials Science  
For seminal contributions to the synthesis and assembly of high-quality 2D materials and their heterostructures.

James Clerk Maxwell Prize for Plasma Physics  
Amitava Bhattacharjee  
Princeton University  
For seminal theoretical investigations of a wide range of fundamental plasma processes, including magnetic reconnection, magnetohydrodynamic turbulence, dynamo action, and dusty plasmas, and for pioneering contributions to linking laboratory plasmas to space and astrophysical plasmas.
APS Special Issue

John Edgar Lilienfeld Prize
For pioneering work on the statistical physics of networks that transformed the study of complex systems, and for lasting contributions in communicating the significance of this rapidly developing field to a broad range of audiences.

Lars Onsager Prize
For verifying the Hills Mechanism as a viable method to generate repeating partial tidal disruption events.

Leo P. Kadanoff Prize
For groundbreaking contributions to statistical and nonlinear physics, including the Grassberger-Proccacia algorithm for obtaining the attractor dimension from chaotic time series, and approaches to describe complex multifractals, diffusion-limited aggregation, and polymer drag reduction in turbulent flows.

Leo Szilard Lectureship Award
For significant, influential analyses of critical issues in international security and arms control, especially in the areas of missile defense, space weapons, and space security; for sustained activities educating students, colleagues, policymakers, and the public about these issues.

LeRoy Apker Award
For outstanding service to plasma and non-equilibrium statistical physics, relativistic and quantum thermodynamics.

Maria Goeppert Mayer Award
For pioneering the development of ab initio computational physics approaches to light-matter coupling and non-equilibrium dynamics and their application to the understanding, prediction and design of quantum materials.

John H. Dillon Medal
For fundamental advances toward a molecular-level understanding of non-equilibrium polymer dynamics and for developing methods to accurately measure extensional deformation of polymeric materials and interfacial flows.

John Wheatley Award
For ongoing commitment to developing physics in Africa through initiating the African School on Electronic Structure Methods and Applications and leadership in bringing together African physicists from across the continent to create a Pan-African physics communication vehicle.

Jonathan F. Reichert and Barbara Wolff-Reichert Award for Excellence in Advanced Laboratory Instruction
For leadership and dedicated efforts in developing sustainable laboratory experiences and courses throughout the entire physics curriculum that address the needs of diverse students who are considering careers in both industry and graduate study.

Joseph A. Burton Forum Award
For outstanding service to science and to the nation in the safe, secure and peaceful use of nuclear power and in the proper and powerful application of science in important legal matters, and for wise counsel on policy issues involving science.

Joseph F. Keithley Award For Advances in Measurement Science
For the development of ultrasensitive multi-pixel transition-edge-sensor calorimeters and spectrometers for applications in astrophysics, nuclear security, materials analysis, and metrology.

Lev D. Landau and Lyman Spitzer Jr. Award for Outstanding Contributions to Plasma Physics
For the theoretical development of the field-particle correlation technique and its application to spacecraft measurements directly showing that electron Landau damping plays a role in the dissipation of space plasma turbulence.

Maria Goeppert Mayer Award
For pioneering the development of ab initio computational physics approaches to light-matter coupling and non-equilibrium dynamics and their application to the understanding, prediction and design of quantum materials.
Max Delbruck Prize in Biological Physics

Arup K. Chakraborty
Massachusetts Institute of Technology

For the leading role in initiating the field of computational immunology, aimed at applying approaches from physical sciences and engineering to unravel the mechanistic underpinnings of the adaptive immune response to pathogens, and to harness this understanding to help design vaccines and therapy.

Mildred Dresselhaus Prize in Nanoscience or Nanomaterials

Eva Andrei
Rutgers University

For the experimental exploration of the exotic properties of low-dimensional electron systems, including the discovery of the fractional quantum Hall effect in graphene and the electronic structure of twisted graphene bilayers that led to the field of moiré materials.

Neil Ashcroft Early Career Award for Studies of Matter at Extreme High Pressure Conditions

Richard G. Kraus
Lawrence Livermore National Laboratory

For extraordinary achievements and leadership within extreme high-pressure science, including novel measurements on material properties, laboratory constraints on planetary evolution, creation of complete equations of state, and the future of programmatic science.

Norman F. Ramsey Prize in Atomic, Molecular and Optical Physics, and in Precision Tests of Fundamental Laws and Symmetries

Olga Kocharovskyaya
Texas A&M University

For pioneering work in quantum coherence and x-ray quantum optics.

Polymer Physics Prize

Jian Ping Gong
Hokkaido University

For outstanding contributions to the understanding of mechanical and fracture properties of hydrogels based on novel network architectures and for discovering the concept of double network gels based on internal overstressed sacrificial bonds.

Prize for a Faculty Member for Research in an Undergraduate Institution

Rae Anderson
University of San Diego

For outstanding contributions and innovative approaches to a fundamental understanding of biopolymer composite dynamics and highly impactful research opportunities and physics training to a diverse set of undergraduate students.

Richard A. Isaacson Award in Gravitational-Wave Science

Emanuele Berti
Johns Hopkins University

For contributions to gravitational-wave science through groundbreaking studies of black hole quasinormal modes, higher multipole radiation, astrophysical detection rates, spin evolution, and tests of general relativity, and for leadership in preparing impactful white papers and review articles.

Robert R. Wilson Prize for Achievement in the Physics of Particle Accelerators

Alex Dragt
University of Maryland, College Park

For pioneering contributions to the development and application of Lie methods in accelerator physics and nonlinear dynamics.

Rolf Landauer and Charles H. Bennett Award in Quantum Computing

Nathalie de Leon
Princeton University

For substantial contributions to the field of experimental quantum information science with an emphasis on materials discovery and enhancement, and using materials to enable improved coherence across a wide range of physical platforms for quantum computing, sensing, and communication.

Stanley Corrsin Award

Rajat Mittal
Johns Hopkins University

For seminal and visionary contributions to the development of immersed boundary methods, and for elegantly applying these methods to reveal the physics of a wide variety of fluid flows in complex geometries, including animal locomotion and heart flows.

Stuart Jay Freedman Award in Experimental Nuclear Physics

Ronald Fernando Garcia Ruiz
Massachusetts Institute of Technology

For novel studies of exotic nuclei using precision laser spectroscopy measurements, including the first spectroscopy of short-lived radioactive molecules.

Thomas H. Stix Award for Outstanding Early Career Contributions to Plasma Physics Research

Jonathan Squire
University of Otago

For theoretical contributions to our understanding of plasma waves and turbulence in astrophysical plasmas and the solar wind, and for the discovery and characterization of a broad class of instabilities in dusty astrophysical plasmas.

Tom W. Bonner Prize in Nuclear Physics

Jen-Chieh Peng
University of Illinois, Urbana-Champaign

For pioneering work on studying antiquark distributions in the nucleons and nucleons using the Drell-Yan process as an experimental tool, and for seminal work on elucidating the origins of the flavor asymmetries of the light- quark sea in the nucleons.

W.K.H. Panofsky Prize in Experimental Particle Physics

William M. Morse
Brookhaven National Laboratory

For leadership and technical ingenuity in achieving a measurement of the muon anomalous magnetic moment with a precision suitable to probe Standard Model mediated loop diagrams and possible manifestations of new physics, which inspired a vibrant synergy between experimental and theoretical particle physics to determine a comparably precise Standard Model prediction and interpret the implications of a possible discrepancy.

TEAM AWARD

Oliver E. Buckley Condensed Matter Physics Prize

J. C. Seamus Davis
University of Oxford

For innovative applications of scanning tunneling microscopy and spectroscopy to complex quantum states of matter.

Ali Yazdani
Princeton University

For outstanding contributions to the understanding of mechanical and fracture properties of hydrogels based on novel network architectures and for discovering the concept of double network gels based on internal overstressed sacrificial bonds.

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Andreas Acrivos Dissertation Award in Fluid Dynamics
Daphne Lemasseurier
University of Texas
For an insightful and comprehensive study, based on innovative and elegant laboratory experiments, numerical analysis and theoretical modelling, of the non-linear dynamics of Jupiter, including its shallow vortices, deep jets and their complex interactions.

Carl E. Anderson Division of Laser Science Dissertation Award
Christoper Panuski
Massachusetts Institute of Technology
For extraordinary work that has significantly advanced the field of optics, precision measurement, and electro-optic devices; in particular, such research accomplishments are milestones on the road to the control and measurement of complex optical fields.

Award for Outstanding Doctoral Thesis Research in Biological Physics
Jonathon L. Yuly
Duke University
For showing that a universal free energy landscape underpins near-reversible electron short-circuiting, thus addressing a central puzzle in molecular bioenergetics that had persisted for over 50 years.

Dissertation Award in Statistical and Nonlinear Physics
Adrian Van Kan
University of California, Berkeley
For outstanding contributions to the understanding of quasi-two dimensional turbulence, demonstrating the presence and nature of phase transitions in such systems using a combination of simulations, modeling and stochastic methods with applications to geophysical flows.

Dissertation Award in Nuclear Physics
Agnieszka Sorensen
University of Washington
For an innovative approach to study the speed of sound in dense nuclear matter using moments of baryon distributions and developing of a framework of simulations and modeling of QCD phases and transitions in nucleus-nucleus collisions.

Dissertation Award in Nuclear Physics
Aobo Li
University of North Carolina, Chapel Hill
For the invention of a novel machine learning algorithm that broke down significant technological barriers with monolithic liquid scintillator detectors and, in turn, delivered the world’s most sensitive search for neutrinoless double beta decay.

Deborah Jin Award for Outstanding Doctoral Thesis Research in Atomic, Molecular, or Optical Physics
Harry Levine
Harvard University
For ground-breaking contributions to the realization of programmable quantum simulators and quantum information processing based on Rydberg atom arrays.

Marshall N. Rosenbluth Outstanding Doctoral Thesis Award
Alison Ruth Christopherson
Lawrence Livermore National Laboratory
For theories of fusion alpha heating and metrics to assess proximity to thermonuclear ignition in inertially confined plasmas, and for the development of a novel measurement of hot electron preheat and its spatial distribution in direct-drive laser fusion.

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APS Journals

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APS Journals
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Princeton University

APS Special Issue
February 2023 • 9

Nicholas Metropolis Award for Outstanding Doctoral Thesis Work in Computational Physics
Mark Turiansky
University of California, Santa Barbara
For the development of novel computational techniques that enable the study of point defects in semiconductors entirely from first principles, and their application to spin centers and single photon emitters for quantum information science.

Richard L. Greene Dissertation Award in Experimental Condensed Matter or Materials Physics
Tiarnan A.S. Doherty
University of Cambridge
For characterizing nanostructure and understanding its influence on phase stability and performance in Halide perovskites.

Richard L. Greene Dissertation Award in Experimental Condensed Matter or Materials Physics
Suraj Cheema
University of California, Berkeley
For atomic-scale design of ferroelectricity and negative capacitance in ultrafine HfO2-ZrO2 films on Si.
APS is seeking nominations for APS prizes and awards to recognize achievements in research, education, and public service. APS awards are open to all members of the scientific community. APS especially encourages nominations of individuals belonging to groups underrepresented in physics, including women, LGBT+ people, disabled people, people from outside the U.S., and Black, Indigenous, and Hispanic people and other people of color.

Learn more at: aps.org/programs/honors
in Germany, I had a subscription to this monthly magazine called Kosmos — it covered all sciences, and I learned so much from that science kit; I built stuff all the time.

When I came to the States, at 12, I could read them, and decided on a career in physics, building stuff. In high school, I took regular physics, AP physics, I took regular math, calculus, advanced math. I loved it all.

What was physics in college like for you?

Brandt is a relatively young school, but it had a fantastic physics faculty and a small cohort of physics majors. It was an amazing experience for me; the die was cast.

But I also learned that I was not cut out for an experimentalist; there was a danger in the lab. Once, I was working in a lab as an undergrad, and I was looking at a piece of metal, maybe three feet by two feet. I had it propped up in front of me on the bench. I was looking at some junctions, but I was klutzy, and the whole thing fell toward me. It was on the order of 60 or 70 pounds. I couldn’t get my hand out of the way fast enough. The chassis pushed the soldering gun into my cheek.

There are initiatives that my predecessors put in place — Jim Gates’ initiative, DELTA-PHY, for example — that have helped push these problems. One of the things I’ve discussed with him is whether we can form closer relations with physics societies whose members may not have felt represented within APS. We need to figure out strategies that we can work with to help bridge those gaps. If it’s not for all sides, it’s dead on arrival.

What else is on your radar, as APS President, for 2023?

We have this incredible tradition to open access journals; we have to weather that well. We’re also looking at our organization itself: There’s a task force on committees, led by Peter Schiffer, that will address how we should operate in a more efficient, effective way.

And we should strengthen relations with our sister science societies, like AAS and AIP, and the societies that are members of APS. This goes to the heart of who we are, as science societies, are looked at by the public, including the political world.

What questions in physics are you excited about?

My own hobby horse — the question I’m interested in — is, where the heck are cosmic magnetic fields from? Why are they so ubiquitous? Have they only existed right from the Big Bang, before photons decoupled from matter, or only afterwards? Why do all these galaxies and stars have magnetic fields? I’ve pondered that for many years.

You’re also quite involved in energy policy. What interests you in this space?

Climate change is driving us to change our energy systems, and the question is how to do that in a way that works not just technically, but economically. One hundred years from now, what will things be like? We could be building new kinds of nuclear fusion reactors, safer ones, and dealing effectively with nuclear waste; perhaps we might even manage controlled fission on an industrial scale, building fusion power reactors. Can nuclear power compete economically with wind and solar power coupled to grid-scale storage?

We don’t know, and that means we have to explore everything. During these next few decades, we’re going to find out the answers to some of these questions, and we have to act — we have to go for it.

Tommy MacKinnon is the Editor of APS News.

Did it leave a scar?

I had a scar for years. I branded myself.

How did your interests evolve in graduate school?

At first, I discovered what I really liked to do. As a theorist, though, they’d make you take a course to show you what experiments were about. I viewed that as a waste. So I picked a project with an experimentalist named Paul Horowitz, who was working northwest of Cambridge, at an observatory with an optical telescope, looking at the Crab pulsar.

In January, I drove out there in my little car. My job was to go up to the prime focus of this telescope, outside, where the photomultiplier tubes were. The job was a bit bizarre for me, but for damn sure: I’m never, ever in this business.”

Strictly theory.

Theory, yes! After that, I got interested in the public. And we have to support folks in all science fields that have something to say about policy. This is a tall order. But APS has a project already ongoing in this direction, the Science Trust Project. I want to strongly support that.

And APS is a member organization. Our members are real people. And I want to think we can drive this process of engaging the public in a way that hasn’t been done before.

In a 2020 UChicago News article, you expressed concern about physics’ lack of diversity. Only 20% of physics doctoral degrees go to women; only 6% go to Black, Indigenous, and Hispanic people.

Why and how should APS work to improve this?

One reason is the health of the discipline itself. To do physics well, you need to be smart, and being smart doesn’t depend on sex or race or ethnic background. There are smart people everywhere, and we need to attract them; if we push people away, that’s a danger to the field. We are poor for not engaging everyone.

There is a task force on committees, led by Peter Schiffer, that will address how we should operate in a more efficient, effective way. And we should strengthen relations with our sister science societies, like AAS and AIP, and the societies that are members of APS. This goes to the heart of who we are, as science societies, are looked at by the public, including the political world.

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Taking the “Childlike” Out of Childlike Wonder

Kids are natural scientists. Why aren’t more adults?

By Asa Stahl

A graduate student is about to share his work in front of a live audience. He feels nervous, intimidated, and a little unprepared. His listeners have high standards and will not hesitate in their criticism. They are, at most, six years old.

That was the first time I read my pop astronomy picture book, The Big Bang Book, to a group of children. Though it went well, what stuck with me most is the deluge of questions that came after the reading. In half an hour, a class of first-graders asked me more about astronomy than every adult I have met has, combined, over the course of my entire PhD.

I walked away from that school trying to understand why. If the common wisdom is that children are natural scientists, then what changes as they grow older?

I often see adults excited to meet physicists but unsure how to engage them. Some cast about for questions and come up empty, others think of questions but hold back for fear of looking ignorant, and many, though they like the idea of physics, will avoid it entirely because they see the field as closed to them.

The first-graders, on the other hand, were used to not knowing. The only obstacle they faced was shyness. Asking questions came naturally to them; they just had to be shown a little of what science has taught us to become excited about what they could learn.

Yet children don’t wonder about the world more than adults — so why don’t adults ask more questions?

I believe that we, as scientists, have too zealously staked our territory. In our effort to be known for proving answers, we have also defined ourselves as the only ones who ask questions.

There are two reasons for this. First, we mainly sell physics to adults through what our field can explain and do. Science communicators, understandably, focus on explaining breakthroughs, milestones of fusion ignition or relativity, meaning it progresses only as we gain new knowledge. The work isn’t done until anyone else can feel comfortable understanding to the public, the better our science is.

That means we must be open about what we do — especially when it comes to momentous events, like the discovery of the Higgs boson — but it often confines science communication to neat explanations. In focusing on what we have learned, we risk presenting physics as a closed book. We lose the appeal of the mysteries.

Second, we have too zealously staked our territory. In our effort to be known for proving answers, we have also defined ourselves as the only ones who ask questions. That sense of mystery and inquisitiveness is the soul of physics, and it presents our best means of engaging the public. A professional physicist may have knowledge that a layperson doesn’t, but the two probably share some of the same questions. That’s the common ground we can build on.

In this light, what we don’t know about physics isn’t a liability — it’s a resource for relating with the public. The questions of physics are fundamental and universal, with a batic claim to everyone’s imagination. I remember, as a third-grader, seeing a poster in my math classroom that asked, “What shape is the universe?” The diagrams of outer space, fit within spheres, toruses, and saddles, boggled my mind. At that age, the world seemed immutable. I often see adults excited to meet physicists but unsure how to engage them. Some cast about for questions and come up empty, others think of questions but hold back for fear of looking ignorant, and many, though they like the idea of physics, will avoid it entirely because they see the field as closed to them.

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That's why we have so many physics communicators eager to present physics as a shared endeavor for all humanity, meaning it progresses only as much as it's widely understood. The work isn’t done until anyone who wants to can understand both the discoveries of physics and its mysteries, and so intentionally run by adults.

How do we communicate science to strike a better balance between questions and answers. Whether a listener is six years old or sixty, we lose an opportunity when we prefer to know everything. Instead, we ought to show confidence in what we do know and excitement about what we don’t. Most of all, it means relinquishing some of our authority as scientists, taking a step down from the pedestal we’ve placed ourselves on and admitting we are still learning — so that everyone else can feel comfortable learning, too.

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March Meeting continued from page 1

Marvin Garvey, California, wrote that one casino manager reported said of the 1986 meeting attendees, “They came with a single twenty dollar bill and one shirt, and they changed neither.”

Past March Meeting chair David Campbell says physicists have a long history of trying to beat the odds in Las Vegas. In the 1970s, several doctoral students from the University of California, Santa Cruz, applied chaos theory to roulette, using a computer embedded in a shoe. The group scored a 44% advantage over the casino — odds that a typical gambler never sees.

The in-person March Meeting will feature thousands of talks, as well as vibrant special sessions, including prize sessions and events inspired by the 2022 Nobel Prize in physics. The award-winning researchers will be available to submit questions in real time to presenters, both at talks and poster slams. Meanwhile, exhibitors will offer live workshops online, and attendees will be able to message companies and request private meetings.

Every March Meeting attendee — virtual and in-person — will have unlimited access to recorded talks and all ePosters from the virtual meeting platform until late June.

This year’s dual format was recommended by the APS Committee on Scientific Meetings, which collected feedback after last year’s hybrid March Meeting. “Our physics community, and the entire world, is still trying to find its feet in this post-pandemic world,” says Vishveshwar.

Attendance of this year’s virtual March Meeting won’t square off with casino house odds, but they’ll have access to excellent online events, including live keynote talks and poster slams, as well as live presentations drawn from abstracts not presented in Las Vegas. Virtual attendees will be able to submit questions in real time to presenters, both at talks and poster slams. Meanwhile, exhibitors will offer live workshops online, and attendees will be able to message companies and request private meetings.

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