AIP

HISTORY NEWSLETTER

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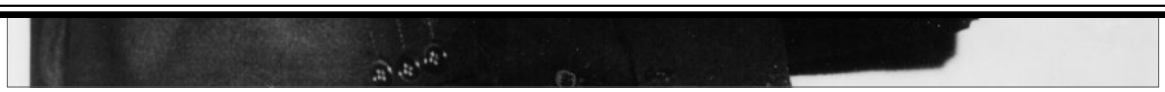
PHYSICS AND POLITICAL POWER DURING THE RED SCARE

Read the article on page 18



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ABOUT THE NEWSLETTER

The *History Newsletter* is a biannual publication of the American Institute of Physics, 1 Physics Ellipse, College Park, MD 20740; email: **history@aip.org** or **nbl@aip.org**. It reports on the activities of the history, library, and archives programs at AIP and on related activities elsewhere.

Front cover: David Bohm reading the newspaper after invoking the Fifth Amendment before the House Un-American Activities Committee. Acme Telephoto, New York World-Telegram and the Sun Newspaper Photograph Collection, Library of Congress, courtesy of the AIP Emilio Segrè Visual Archives.

IN THIS ISSUE

DIRECTOR'S INTRODUCTION: ON OUR CENTER AND OUR INSTITUTE

By William Thomas, Spencer R. Weart Director of Research in History, Policy, and Culture

Sixty years ago, on July 1, 1965, the American Institute of Physics formally established a unit called the Center for History and Philosophy of Physics. It combined three interrelated initiatives: AIP's new Niels Bohr Library, an associated History of Physics Archives, and what had been a four-year documentation project called the History of Recent Physics in the United States.

The drawing on the facing page, dating from that time, shows how from the very beginning AIP was thinking ambitiously about its history work. What was created was perhaps more modest: the Center has certainly never had its own building. But instead, its leaders and staff worked to make it into an intellectual center for a worldwide community of scientists, historians, and other stakeholders in the history of the physical sciences.

The model they created proved enduring and influential. Notably, in 1980 IEEE established its Center for the History of Electrical Engineering, now called the IEEE History Center. The Center for the History of Chemistry was established in 1982, later to become the Chemical Heritage Foundation, and it is now the Science History Institute, covering chemistry, engineering, and the life sciences.

Today, AIP is poised to blaze new trails again. Our history, library, and archives staff now numbers a baker's dozen. We have just refreshed our digital presence at aip.org and set up new weekly and monthly email newsletters. This August, our Early-Career Conference is taking place in Brazil, recognizing that the community we support is a truly global one. And, to underscore that point, we received a remarkable nineteen applications in our latest grant-in-aid cycle, with the six recipients representing six different countries across four continents.

Attentive readers might notice we have stopped referring to the "Center for History of Physics" (an abbreviated name adopted in 1972). For over forty years, the Center was an umbrella encompassing the Niels Bohr Library & Archives and our history research efforts. NBL&A became a parallel unit in 2007, meaning the Center now only referred to the "history" side of our operations. For outsiders, this was surely a distinction without a difference, and it no doubt caused confusion among those navigating a website bifurcated between NBL&A and CHP.

In sunsetting the Center moniker, we are not undertaking a reorganization or renaming so much as thinking more holistically about ourselves and our work. In 2019, a new Strategic Framework set AIP-wide goals, one of which was for us to embrace our identity as the American *Institute* of Physics. That means an organization that cultivates "research and analysis expertise in relevant areas that include public policy, the demographics of relevant scientific communities, education, scholarly publishing, career development, and the history of the physical sciences."

A key implication is that historical research will increasingly suffuse throughout AIP's work on matters such as career paths in the physical sciences, the profession's evolving demographics, international scientific exchanges, and science policy. Similarly, we want our work on contemporary issues to inspire our work in history so as to bring the past and present into a more vibrant and productive dialogue, enabling a better future.

The present moment in the United States certainly demands all the insight we can bring to an unprecedented landscape. This issue's feature article looks at the tactics that anticommunist crusaders used in the early Cold War to pressure the physics community—as well as at what power the community had to push back. The Red Scare is an imprecise analogue to our situation, and many of its threats actually pale in comparison to recent developments, but it is a starting point for conversations about political power that physicists have not really had to have for generations.

Beyond studying historical cases, AIP is also setting up a policy research and analysis function that is led by a new associate director, Lindsay Milliken, an expert in high-skilled immigration policy who previously worked for the Federation of American Scientists, the European Union delegation to the US, and the Institute for Progress think tank. Lindsay's policy work included delving into the history of immigration legislation and programs dating back to the 1960s, and we are excited for what she will do in collaboration with AIP's history, statistical research, and policy reporting teams, as well as other groups across our institute.

PROPOSED NIELS BOHR CENTER FOR RESEARCH
IN THE HISTORY OF PHYSICS

NEW WEB EXPERIENCE AND EMAIL NEWSLETTERS LAUNCH

We are excited to announce that AIP's history program has refreshed its web presence, which is now located at **aip.org/research**. As the URL suggests, the new website provides resources on the physical sciences enterprise for researchers without drawing sharp distinctions between areas such as history, statistics, and policy. While our resources in each of these research areas are fairly distinct in character, we anticipate that strengthened collaboration across AIP's research team will make the boundaries between them quite fluid as time passes.

A major advantage of the new site is simply that it looks great! Eye-catching text and graphics showcase the quality of our collections and make it easier for users to discover and locate different resources. A few clicks through a handful of landing pages will turn up information about our library collections, digital collections, oral history and photography collections, Lyne Starling Trimble public event series, grant programs, and informational resources like our web exhibits and teaching guides.

Moreover, it is no longer necessary to understand the distinction between our history program and the Niels Bohr Library & Archives to navigate our site. If you're not sure where something is, there are probably multiple ways to get to it. Of course, we won't get things perfect right away, and we will refine the site's design as we proceed, making it more intuitive to use.

As part of our web upgrade, NBL&A has also upgraded its digital repository platform, which is located at **repository.aip.org** and is home to our renowned Emilio Segrè Visual Archives and now also our collection of some 2,000 oral histories. The relocation of the oral histories has allowed us to store them in a downloadable, paginated PDF format. We recognize the shift has been disruptive for some users, particularly those who had favorite interviews bookmarked, and we are continuing to improve users' ability to search and browse our digital collections.

Alongside our web upgrade, we have launched two new email newsletters that respectively appear every Friday and at the end of every month.

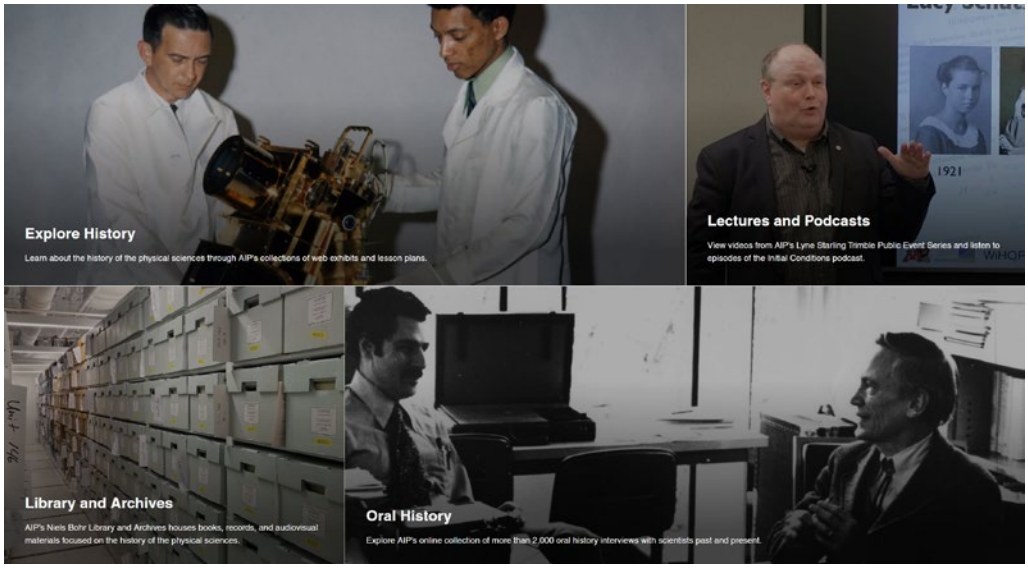
Previously, we communicated with our stakeholders solely through this semiannual *Newsletter* and the NBL&A blog "Ex Libris Universum." Taking a page from AIP's highly successful *FYI* science policy email newsletters, we wanted to reach out much more frequently to keep people better engaged with everything that is happening, not only here at AIP but throughout the history of the physical sciences community.

If you have been signed up to receive periodic email notifications from the history program, you are automatically subscribed to receive our Monthly Update email. It will let you know about upcoming events and new event recordings, newly posted oral histories and other newly available collections, upcoming grant-in-aid deadlines, and recent blog posts and Weekly Edition emails.

The Weekly Edition is a new email list that provides a single article to recipients. From week to week, it could include an original history feature, a program from a history workshop, an overview of a recent history publication, a Q&A with a scholar, or anything else that might interest our community.

To sign up for the Monthly Update, the Weekly Edition, and other AIP emails, visit **aip.org/newseletters**.

A navigational section of the new AIP history website.



NEWS FROM AIP

LYNE STARLING TRIMBLE PUBLIC EVENTS

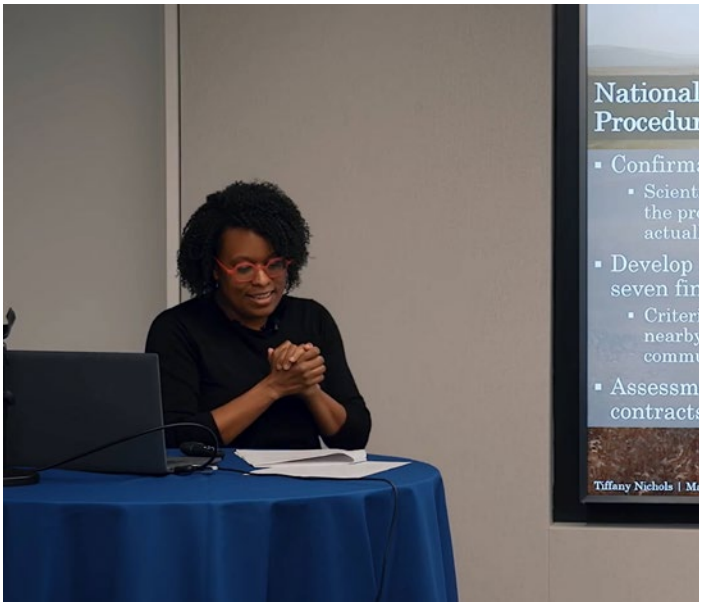
This spring, we hosted three lectures in our Trimble public event series at AIP's offices in downtown Washington, DC. All dealt with efforts to grapple with the modern mysteries of gravitation, but their approaches to the subject varied from the development of scientific ideas, to science policy, to the role of history and philosophy in scientific investigations.

This event series is partially endowed through a generous donation that astronomer Virginia Trimble gave to AIP in 2013 in honor of her late father, the chemist Lyne Starling Trimble. If you can't join us in person, recordings of past events are available at **aip.org/history/events** and on our YouTube channel at **www.youtube.com/@aiphistory**.

On April 4, we welcomed **Jaco de Swart** from MIT for a discussion of the history of attempts to connect particle physics to the gravitational effects of dark matter, which he has been studying with the support of an AIP Helleman Postdoctoral Fellowship. In his lecture, De Swart illuminated early attempts to explain dark matter effects as arising from massive neutrinos and how the idea of a neutrino-dominated cosmos surged in scientific popularity in the early 1980s. However, the theory was demonstrated to be unworkable after just a few years, making way for hypothesized weakly interacting massive particles (WIMPs) to become a leading candidate. Attempts to detect WIMPs have so far been unsuccessful and experiments are beginning to pick up signs of neutrinos from space, which may constitute a "fog" that would obscure any WIMP signals. Per De Swart, this problem could clear the way for another shift in approach.

Jaco de Swart

On May 2, **Tiffany Nichols** from Northeastern University examined how it was decided that the twin detector facilities of the Laser Interferometer Gravitational-Wave Observatory (LIGO) would be respectively sited in Hanford, Washington, and Livingston, Louisiana. Nichols related that sites originally proposed by LIGO project leaders proved unworkable. For example, the blueberry barrens of Maine, which were favored by Rainer Weiss, proved to have an overly complicated landscape and knotty conflicts with blueberry farming. National Science Foundation Director Walter Massey ultimately implemented a federal site-selection process that was adapted from the then–recently completed site selection for the Superconducting Super Collider, balancing scientific, engineering, legal, and other practical constraints.



Tiffany Nichols

Finally, we were joined on May 30 by the renowned Harvard University historian **Peter Galison**, who discussed the role that history and philosophy play in Harvard's Black Hole Initiative, which he directs. He detailed the considerations that went into how to integrate data from the radio telescopes around the world comprising the "Event Horizon Telescope" (EHT) and processing it to legitimately obtain the first-ever "images" of a black hole. He noted that the strategies used drew on different traditions of objective representation that stretch back to the 18th century, as outlined in his book *Objectivity*, which he wrote with Lorraine Daston. In addition, Galison recalled the additional dilemmas that went into deciding on a single image to release to the public, and he previewed plans for a space-based expansion of the EHT to study black holes in finer detail by imaging the photon rings orbiting them.

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Peter Galison

In August, we will have two more Trimble lectures that will double as keynote addresses at the AIP Early-Career Conference in Salvador, Brazil:

August 4, 2025
Gisela Mateos (National Autonomous University of Mexico)
"Physics on the Move: Technical Assistance for Development in Latin America"

Abstract: The International Atomic Energy Agency (IAEA) and its technical assistance programs set in place a machinery that mobilized experts in the field of nuclear science and technology. Established in 1957, it became an essential tool for the internationalization and standardization of atomic technologies and practices and for promoting geopolitical influence in the Third World. One of Latin America's first IAEA technical assistance activities was the Mobile Radioisotope Exhibition, which began in Mexico in 1959. It marks the beginning of a series of programs that mobilized people, knowledge, and materialities. This talk will delve into how IAEA's resources were leveraged through technical assistance programs for local scientific and institutional goals during the 1960s and 1970s, embedded in the discourse of development at the intersection of international scientific collaboration, political interests, and technologies.

August 8, 2025
Olival Freire, Jr. (Federal University of Bahia)
"Science, Foundations, and Technology: Lessons from the History of the Hundred Years of Quantum Mechanics"

Abstract: Quantum mechanics emerged laden with issues and doubts about its foundations and interpretation. However, nobody in the 1920s and 1930s dared to conjecture that research on such issues would open the doors to developments so huge as to require the term "second quantum revolution" to describe them. On the one hand, the new theory saw its scope of applications widen in various domains, including atoms, molecules, light, the interaction between light and matter, relativistic effects, field quantization, nuclear physics, and solid state and particle physics. On the other hand, there were debates on alternative interpretations, the status of statistical predictions, the completeness of the theory, the underlying logic, mathematical structures, the understanding of measurements, and the transition from the quantum to the classical description. Initially, there seemed to be a coexistence between these two orders of issues, without any interaction between them. However, the connections among debates on foundations, scientific achievements, and potential technological applications opened the doors for a new chapter in quantum history, a chapter many call quantum technologies. In this talk we exploit the connections among scientific achievements, foundational debates, and technological applications exhibited by quantum mechanics throughout its history.

We have not yet scheduled lectures for this fall in Washington, DC. To stay up to date on our schedule, sign up for our Monthly Update email here: **aip.org/newsletters**.


Photos courtesy of Gisela Mateos and Olival Freire, Jr.

GRANTS-IN-AID FOR HISTORICAL RESEARCH

AIP provides grants to scholars and writers to support their research in the history of the physical sciences, with a maximum award of $2,500 per project, which is paid on a reimbursement-for-costs basis. Application deadlines fall on April 15 and November 15 each year. Application guidelines are available at **aip.org/aip/awards/history-grants-in-aid**. Awardees from recent cycles include

Bruna Di Fatima de Alencar Carvalho (Federal University of Bahia)—To support archival research at the Fundação Getulio Vargas in Rio de Janeiro and the Itamaraty Historical Archive in Brasília on the role of José Leite Lopes as a leader in Brazilian science.

Yuxin Fang (University of Minnesota)—To support archival research at King's College London, Cambridge University, and the University of Edinburgh on the political motivations of early scholars of Einstein.

Sebastian Fernandez-Mulligan (Yale University)—To support archival research at Princeton University and the University of

Illinois as well as oral history interviews related to the emergence of far-from-equilibrium physics.

Duim Huh (University of Tokyo)—To support archival research at AIP, the American Philosophical Society, the Science History Institute, and MIT on international diplomacy surrounding distribution of the Physical Science Study Committee curriculum in Japan.

Mahmoud Jalloh (St. John's College, Santa Fe)—To support oral histories with philosophers of physics as part of a larger project on the history of logical empiricism.

Luisa Lovisetti (University of Milan)—To support oral history and archival research on the history of quantum physics research at the University of Milan, including interviews with founding figure G. M. Prosperi.

Rebecka Mähring (Cambridge University)—To support archival research and oral histories at the Byurakan Observatory in Armenia relating to Viktor Ambartsumian's work on dark matter.

Patrick McCray (University of California, Santa Barbara)—To support oral histories relating to research on exoplanets and the concept of planetary habitability, in collaboration with Matthew Shindell from the National Air and Space Museum.

Nithyanand Rao (University of California, San Diego)—To support archival research in papers of Frederick Reines held at Case Western Reserve University and the University of California, Irvine, in order to investigate neutrino experiments conducted at the Kolar Gold Fields in India.

Katerina Zouboulakis (Trinity College Dublin)—To support oral histories and research at various archives in the United Kingdom on the history of the Irish Meteorological Service.

WELCOME TO OUR SUMMER INTERN

The Society of Physics Students provides annual summer internship opportunities for physics undergraduates at AIP and partner organizations. This summer, the history, library, and archives teams are excited to welcome Kalen Stefanick, who has written a brief introduction:

Hi, my name is Kalen Stefanick (they/them or he/him). I will graduate from Simpson College in December 2025 with majors in physics and English and a minor in women's and gender studies. I am especially interested in the intersection between the sciences and humanities, and hope to pursue a career in nonfiction publishing or science communication.

I have been highly involved in clubs and activities at Simpson over the years, serving as president of both PRIDE and Physics Club, playing in the band and orchestra, and working as a Writing Center consultant. In my free time, I love to write poetry, read, explore nature, pet cats, listen to music, and engage in political activism.

I think the person behind the discovery is just as important as the science itself, but the humanity of researchers and theorists is often ignored. Working in the history of physics is a unique opportunity to illustrate the variety of human experiences and perspectives that have driven scientific developments over time. I strongly value diversity of race, class, sex, gender, ability, and cultural identity, because I believe diversity is what breeds innovation.

I also bring a different perspective to physics. Toward the end of my second year at Simpson, I came out as transmasculine nonbinary. I had struggled with my identity and self-image for years, but realizing I was trans suddenly opened up a whole new world of freedom and possibility. I cut my hair, changed my name and pronouns, and started hormone replacement therapy (HRT), and I felt so much more alive and at home in my body. I believe representation is endlessly important, especially in fields like physics that have historically lacked diversity.

Growing up, I was never able to point to any historical figures or role models that truly felt like me. Queer and transgender people deserve to be in STEM, and I want to be that LGBTQIA+ representation for someone else. I am grateful for this SPS internship with the history, library, and archives teams, which will hopefully give me the opportunity to explore and uplift the stories of underrepresented physicists.

Photo courtesy of Kalen Stefanick

ORAL HISTORY UPDATE

Recently posted oral histories include additional interviews from series we have already been processing that are focused on quantum computing, heliophysics, and the Superconducting Super Collider, as well as interview sets arising from our partnerships with three AIP Member Societies: the American Astronomical Society, Society of Rheology, and American Crystallographic Association. We also posted interviews by two grant-in-aid recipients: undergraduate student Montse Zeron and retiree Mike Duncan, which are respectively on the James Webb Space Telescope and nonlinear optics. Zeron and Duncan each discuss their experiences in the next article.

In addition, we have several notable new one-off oral histories. Gordon Baym of the University of Illinois discusses his work on topics such as neutron stars and his involvement with Brookhaven National Lab's Relativistic Heavy Ion Collider and its follow-on Electron-Ion Collider. Jim McGroddy recounts his long career at IBM, including his efforts to bridge its basic research and product development activities and his leadership of IBM Research during the company's 1993 crisis. Florida State meteorology professor Sharon Nicholson talks about her work on global weather patterns and her experiences as a woman in her field.

One other interview we will highlight is one from 1990 with Adnan Waly, a physicist who had worked in Nazi Germany during the early days of nuclear physics. Among his recollections are one of acting as a courier for Max von Laue to deliver letters recommending Jewish scientists who were looking to escape the country. Although we had permission from Waly to post this interview, it long sat neglected in our files because we did not have permission on file from the interviewer, physicist Alexander Tenenbaum. Fortunately, a request from a researcher turned our team's attention to the interview, and we tracked down Tenenbaum and cleared the way for it to, at long last, be made available to everyone.

Interviews posted to repository.aip.org/oral-history-interviews-ohi, November 2024–May 2025

- **Gordon Baym** (Jan. 24 & 31, 2024)—University of Illinois theorist of matter under extreme conditions
- **Sergio Boixo** (Sept. 10, 2024)—Quantum computing leader at Google
- **Robert Byer** (Nov. 20, 2024)—Stanford University physicist and expert in lasers
- **Richard Canfield** (Aug. 29, 2017)—Montana State University expert in heliophysics
- **Doug Duncan** (May 23, 2022)—University of Colorado Boulder astronomer and Fiske Planetarium director
- **Jan Eldridge** (July 11, 2024)—University of Auckland astrophysicist and LGBTQ+ rights advocate
- **Marty Fejer** (Nov. 19, 2024)—Stanford University specialist in optical physics
- **Tamir Gonen** (July 9, 2023)—UCLA specialist in electron crystallography and cryogenic electron microscopy
- **Laura Greene** (Nov. 27, 2020)—National High Magnetic Field Laboratory chief scientist
- **Stephen Harris** (Nov. 22, 2024)—Stanford University specialist in optical physics
- **Andy Kraynik** (Oct. 15, 2024)—Rheologist at Sandia National Laboratories and expert in structure and flow of foams
- **Jim McGroddy** (Aug. 14, 2024)—Physicist and IBM director of research
- **Celia Merzbacher** (Sept. 11, 2024)—Quantum Economic Development Consortium executive director
- **Matt Mountain** (June 12, 2024)—Leader in US astronomy facility development and operations
- **Sharon Nicholson** (Jan. 23 & 26, 2025)—Florida State University meteorologist, expert on climates in Africa
- **John Rees** (Sept. 2, 2009 & May 6, 2010)—SLAC physicist, Superconducting Super Collider project manager
- **Yuen-Ron Shen** (Nov. 21, 2024)—UC Berkeley physicist specializing in nonlinear optics
- **Seth Shostak** (Aug. 2, 2018)—Senior astronomer at the SETI Institute and popular science communicator
- **Grant Tremblay** (Aug. 8, 2024)—Scientist at Harvard-Smithsonian Center for Astrophysics
- **Adnan Waly** (Nov. 12, 1990)—Nuclear physicist and émigré from Nazi Germany

Photo courtesy of Jan Eldridge

Sergio Boixo. Photo by FBenitoCigona via Wikimedia Commons, CC BY-SA 4.0.

Last year, the AIP history program's Society of Physics Students summer intern Kai Hostetter-Habib conducted an oral history with Jan Eldridge, an astrophysicist at the University of Auckland and an advocate for LGBTQ+ rights:

The reason I said yes [to this interview] is because there may be other people like me who can see themselves as an astronomer because of this interview, and I think that's really key. I'm a nonbinary trans woman, which is difficult, because you've got to think: What does that mean? How can you be nonbinary and a woman? But I'm trans because my gender doesn't align with my birth. People are complicated. We often think the universe is complicated. That's true. So are people.... The best way to try and sum up my entire being is to say, "I study exploding binary stars while exploding the myth of a gender binary."

AIP also spoke last year with Sergio Boixo, a leader in quantum computing at Google, about the company's strategy for advancing the field. Among the points he raised was that it is already possible for quantum processors to make minor but instructive scientific discoveries:

We call it "discoverinos." [A discoverino is] like a small discovery, because it is actually a discovery [where] experimentalists find something out [but] we don't understand easily what's happening. Eventually, we studied the theory, and we can do simulations, and we can explain it. The quantum processor wasn't, if you want, necessarily critical for that particular discovery, but it was used because it's faster and easier, and it motivates you actually to do experiments and find things out. We work a fair amount in discoverinos.

The James Webb Space Telescope under construction. Photo by Chris Gunn / NASA.

REPORTS FROM OUR COMMUNITY

GRANTS-IN-AID RECIPIENTS

AIP grants-in-aid provide support to history researchers, enabling work to proceed in a wide range of areas that we could not support solely in-house. Grants are also an excellent way to bring new people into our worldwide network of collaborators, and they are one of our best tools for giving students and early-career researchers experience in archival work, oral history interviewing, and applying for external research support. We are pleased to share some reports from them on their work.

Oral histories on the James Webb Space Telescope
Montserrat Zeron, Florida State University

From a young age, I wondered how humans could explore the seemingly impossible: the overwhelming vastness of outer space. My undergraduate honors thesis at Florida State University sought to investigate just that. Particularly interested in the role of diplomacy on the success of space science missions, I focused on the James Webb Space Telescope (JWST). My work aimed to tell a story that highlighted the many ways by which diplomatic mechanisms shaped the successful launch and current operation of JWST.

While not without its troubles—enduring cancellation hearings, public scrutiny, severe delays, budget overruns, costly human errors, and even a natural disaster—Webb's success comes to represent not only the best of the international scientific community, but of humanity.

Launched in December 2021, the telescope's recent deployment offered a rare opportunity to engage directly with those involved in its development. In addition to consulting dozens of documents from archival collections relating to NASA's space policy and JWST, I conducted oral history interviews with prominent astrophysicists who held a wide variety of roles throughout JWST's development. Their insight shed light on the wide range of actors whose roles were essential for the project's success, from agency headquarters and the US Congress, to scientists, engineers, private contractors, and the public.

While countless actors were involved, my thesis identifies the scientist as the most important diplomatic actor in the success of international space science missions. My research introduces a novel scholarly perspective to international relations, while the interviews I conducted also contribute to the historical understanding of astrophysics. Transcripts for these interviews are available on AIP's website.

Archival research on quantum information science
Silvia Castillo Vergara, University of Toronto

Every historian follows a breadcrumb trail. Mine led to John Archibald Wheeler. That alone was surprising. My trail, after all, was about tracing the early history of quantum computing and quantum information—fields that at first glance had little to do with him. Wheeler, who had a long and distinguished career at Princeton, is best known for his work on nuclear fission, general relativity, and black hole physics. Yet, as I gathered profiles of key figures in quantum computing and quantum information, the more I encountered Wheeler's name in acknowledgments and references. Eventually, I found that several of these figures had passed through the University of Texas at Austin in the late 1970s and early 1980s, after Wheeler established the Center for Theoretical Physics there. It quickly became a thread worth pulling.

After retiring from Princeton, Wheeler used his move to Texas as an opportunity to shift focus from foundational questions in general relativity to others in quantum mechanics. Once in Austin, Wheeler assembled a dynamic group of faculty, doctoral students, associates, and visiting scholars, many of whom spent varying lengths of time at the newly established center. As one visitor later recalled, "I would like to visit Austin again. The climate is infernal, but the people are marvelous."

Thanks to the rich collection housed at the American Philosophical Society, I've been able to reconstruct what the atmosphere at the Center for Theoretical Physics was like during those years. Wheeler's meticulous notebooks—filled with day-to-day

Continued on page 14

thoughts, conversations, and ambitions—and the carefully preserved correspondence offer a vivid glimpse into the fruitful intellectual exchange that took place.

During this period, Wheeler deepened his ontological commitment to information as a fundamental element in understanding quantum mechanics, and, by extension, the universe itself, famously captured in his phrase "it from bit." Within the environment he fostered, an information-based approach to quantum theory began to take shape. Concepts such as information distance, the no-cloning theorem, and information-theoretic reformulations of core quantum principles arose.

It is through the conversation between Wheeler's ontological commitments and his students' more grounded research that this collection has proven instrumental. Going forward, this episode will help me illustrate the broader transformation through which information became a foundational concept in quantum physics. It will also help recover a lesser-known but significant chapter of Wheeler's career.

Linda Reichl and John Wheeler congratulate Bill Wooters, center, on passing his PhD oral exam. AIP Emilio Segrè Visual Archives, Wheeler Collection.

Oral histories on nonlinear optics

Mike Duncan, Retired, Formerly at the Naval Research Laboratory

In the late 1970s, I did my doctoral research at Stanford University under Prof. Robert L. Byer. By then he had already made important contributions to laser physics and used the coherent nature of laser light to generate new frequencies based on nonlinear optical effects in crystals. He helped invent coherent anti-Stokes Raman spectroscopy (CARS) and used second-harmonic generation and four-wave mixing to produce new coherent wavelengths in the visible and infrared. He also pioneered many innovations in lasers themselves, including helping to develop the lasers used in the Laser Interferometer Gravitational-Wave Observatory (LIGO).

Thanks to the generous support of the AIP Grants-in-Aid program, in November 2024 I was able to conduct an oral interview with Robert Byer, as well as three other pioneers in the field of nonlinear optics who still lived or taught in the San Francisco Bay area: Prof. Steven Harris and Prof. Martin Fejer at Stanford University, and Prof. Yuen-Ron Shen at Berkeley. Steve Harris was Robert Byer's thesis advisor and had a distinguished career working with nonlinear optical effects in atomic systems, being one of the pioneers in electromagnetically induced transparency (EIT) and the subsequent ability to make "slow light." Marty Fejer was a Byer student and has worked extensively in the area of second-harmonic generation using quasi-phase-matched materials such as periodically poled lithium niobate, an area that has increasingly important applications in photonic integrated circuits (PICs). And Ron Shen pioneered the development of optical second-harmonic generation and sum-frequency generation as powerful and versatile spectroscopic tools for many areas of surface science.

It was a great experience to hear and record first-hand accounts from these pioneers in the field of nonlinear optics and to learn details about their research, their collaborations, and their accomplishments in this important area of optical physics.

Robert Byer, center, being awarded Optical Society of America's Adolph Lomb Medal for 1972. AIP Emilio Segrè Visual Archives, Physics Today Collection.

Archival research on international standards
Sara Bassanelli, Politecnico di Torino / Università di Pavia

It is no secret that throughout the 20th century, a range of US institutions, scientific and technical, played a leading role in shaping international discussions on units of measurement and physical constants. But how did the history of these standards evolve over the last century? What interests drove such a diverse group of actors to engage in these debates? And most importantly, what role did physicists play in this complex system of negotiations?

As a PhD student in the history of science, jointly affiliated with the University of Pavia and the Polytechnic University of Turin, I am working to answer these questions by reconstructing the history of what I call the "diplomacy of international standardization." My research has taken me across Europe and the United States—particularly to Washington, DC, a key stop where several archives hold invaluable material for my investigation.

Sara Bassenelli visits the AIP Niels Bohr Library & Archives. Photo by Trevor Owens / AIP.

Thanks to the support of AIP, I spent a month conducting daily research, gathering critical documents on the history of the US National Bureau of Standards, the American Institute of Physics, the National Research Council, and numerous individuals involved in international standardization efforts. I worked across the Niels Bohr Library & Archives, the NIST Museum & Archives, the Library of Congress, and the National Archives, ultimately photographing more than 2,000 documents that now form the foundation of the second chapter of my dissertation, titled "Negotiating the System of Electrical Units, 1930s–1960s."

Although my initial aim in visiting the US was to reconstruct the American national role in international standardization debates, I was pleasantly surprised to find that these archives offered much more than a single-country perspective. Thanks to the meticulous help of archivists, I uncovered fragments of a broader historical process—pieces of a complex puzzle that extend beyond the American narrative to reveal a layered and interconnected institutional history of physics on a global scale.

Archival research on Chien-Shiung Wu
Michelle Frank, Independent writer

For decades, physicists have debated Chien-Shiung Wu's omission from the Nobel Prize. In 2024, with generous support from AIP, I visited the Center for History of Science in Stockholm to learn more. Wu is best known for her experiment proving the nonconservation of parity for weakly interacting particles. In 1957, T. D. Lee and C. N. Yang received the Nobel Prize for their theoretical work on the same topic. Wu earned, seemingly, almost every other scientific award thereafter.

When I set off for Sweden, I knew the 1957 Nobel records were sealed, but I also knew Wu had been nominated repeatedly, and some of the records from later years were open. The archivists were so welcoming, including me in meals, conversations, even a colleague's birthday celebration. The director, Karl Grandin, oriented me to the structure and organizational system of the collections. Thus prepared, I found my way through committee meeting minutes, nominations, and commentary. The thick, leather-bound volumes are predominantly written in Swedish, with letters of nomination appearing in other languages. It was a joy and a challenge to work with these materials.

Since 1901, only five women have ever been recognized for a Nobel Prize in Physics—a startlingly low number considering the committee has had more than 372 chances to celebrate women's contributions. (The rule limiting prizes to three

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recipients came more than half a century later.) Nominations don't arrive every year in support of women, but the committee can add nominees if they choose. Indeed, they did so most famously for Marie Curie.

A few nominators commented directly on the dearth of women recipients in later proposals (not related to Wu). There's no proverbial "smoking gun" explaining the omissions, but that's typical in cases of identity-based disparities, which often depend on indirect evidence for interpretation. The historical materials speak volumes about how societal and cultural understanding has shifted over the decades. Letters and commentary reveal cultural blind spots. The visit was enormously important to my research.

In his Stockholm speech, Yang made it clear that Wu's experiment played a decisive role in the 1957 award, applauding her courage. Wu advised Lee and Yang about their radical theory in 1956 before they published. Then she designed and led an experiment that proved they were right. Although more than fifty years have passed since Lee and Yang were honored, and regrettably T. D. Lee passed away last summer, C. N. Yang is still alive today. I continue to hope it may be possible to talk with him.

A sneak preview of my work on Wu will be available soon in *Women in the History of Quantum Physics: Beyond Knabenphysik*, from Cambridge University Press. A fuller narrative is forthcoming with Basic Books.

Chien-Shiung Wu. AIP Emilio Segrè Visual Archives, Segrè Collection.

AN UPDATE FROM AIP HELLEMAN FELLOW RUWARD MULDER

AIP's Helleman Fellowship program was created through a bequest from the late physicist Robert H. G. Helleman to provide financial assistance to graduate students and postdocs in physics and related fields who are Dutch citizens and are looking to continue their work in the United States.

A year ago, AIP awarded a Helleman Postdoctoral Fellowship to philosopher of physics Ruward Mulder. Mulder completed his PhD in the Department of History and Philosophy of Science at Cambridge University and last fall began working with James Weatherall in the Logic and Philosophy of Science (LPS) Department at the University of California, Irvine. We checked in with him to see how his work is progressing.

Can you tell us a little about the goals of your fellowship work?

On both formal and philosophical levels, I explore the space of spacetime theories. This "space" is populated by a surprising variety of formulations—some well known, others only partly conceived—that all purport to describe relativistic gravity. I'm a philosopher of physics particularly interested in this kind of underdetermination, when different theories can make the same predictions, sometimes even exactly so. To this end, I analyze three cases.

First, the so-called "geometric trinity of gravity"—comprising general relativity (which employs curvature as the explanation of gravitational effects), teleparallel gravity (which uses a flat but torsionful spacetime), and symmetric teleparallel gravity (which breaks the compatibility between metric and connection)—is a trio of quantitatively equivalent theories. Yet, in recent years several responses to this underdetermination have been emerging in very precise ways, such as Occamism, spacetime functionalism, or reinterpretational approaches. I clarify what kind of differences these make: Are they mere reformulations of the same physics, or do they offer fundamentally distinct pictures of reality?

Second, I revisit the idea, going back to Reichenbach, that different spacetime models can be made empirically equivalent by postulating "universal forces." I build on recent work by James Weatherall and J. B. Manchak, who show that for a reasonable assumption of how such "forces" should behave (namely, that they're represented

by a rank-2 tensor in the geodesics equation), this cannot always be done for general relativistic models. I then exploit this proof to systematically discover equivalent models and to evaluate their physical feasibility under this force concept.

A third project explores another result by Weatherall and Manchak: that general relativity is significantly less susceptible to such underdetermination than its Newtonian predecessor when formulated geometrically (as in Newton-Cartan theory). The difference, I show, arises from the degeneracy of the metric tensor in the nonrelativistic theory—a technical feature that dissolves the glue between space and time.

Taken together, I'm mapping out a concrete spacetime footing for Kyle Stanford's "problem of unconceived alternatives," which says that we cannot trust our current best scientific theories to be true, because, as a historical fact, scientists in the past have repeatedly failed to exhaust the space of plausible alternative theories. Rather than such abstraction, I believe that at least the nearby neighborhood of the space of alternative spacetime theories can be systematically mapped. This also blurs the lines between "conceived" and "unconceived." For example, a theory that breaks the Hausdorff condition, modeling gravity via Einstein algebras, is not entirely conceived of but can hardly be said to be unconceived. In this systematic way, we don't just learn about gravity—we learn what it means to theorize about spacetime in the first place.

What makes UC Irvine a good place to continue this work, and how have things been going?

The LPS department at UC Irvine is a unique environment with many students working on a wide range of foundational issues in physics, formal epistemology, behavioral science, logic and mathematics, and much more. It is therefore a hugely inspiring and educational place to be, for not only is the department so broadly engaged, the individual researchers also move seamlessly between these topics—a sign of confident, high-quality research.

For my own work, I'm grateful for the Helleman fellowship's support in enabling me to pursue these questions in this environment, for I am lucky to have James Weatherall, J. B. Manchak, and Kyle Stanford nearby at this department. This has also meant stepping up my game in formal methods, having spent part of the year studying meta-mathematics, category theory, the fiber-bundle formulation of gauge theories, and even a return to set theory. (One is never too late to admit not getting the basics!) Also, we have regular meetings where we discuss our work or read some articles on topics like determinism in relativity theory. Earlier this year, several students organized a high-level reading group on the foundations of algebraic quantum field theory, which was spectacular given the time and care we took to walk through the issues in a precise way. At LPS, I often had the experience of doing serious philosophy in the middle of a physics conference, without wanting it any other way.

Since arriving at UCI, I've had the chance to present my research within the department and at conferences in New Orleans, Toronto, Caltech, and San Diego, with many more to come. Two new papers are written and under review, with two more are drafts nearing completion. It's been a productive and exciting year, and I look forward to continuing this work in such a dynamic academic home.

Photo courtesy of Ruward Mulder

PHYSICS AND POLITICAL POWER DURING THE RED SCARE

By William Thomas, Spencer R. Weart Director of Research in History, Policy, and Culture

American physics has been largely insulated from hardball politics during the current century—affected by broader battles over government spending, certainly, but also enjoying generally steady, bipartisan support. However, the second Trump administration's radical gutting of government programs and the civil service and its targeted defunding of universities have suddenly thrown the profession into a reality where the sharper sides of political power are all too relevant.

History cannot see us through our current moment, but it can spur renewed thought about the nature of political power and the sorts of choices that individuals and institutions now face. After World War II and the atomic bomb, leaders in physics ascended to national prominence as government advisers and public figures. But at the same time, some physicists became targets of fervently anticommunist politicians and government officials, who alternately regarded them as espionage threats or as promoting naive political views that could weaken the United States in its standoff with the Soviet Union.[1]

By far the best-known case of a scientist caught up in this "Red Scare" is, of course, Robert Oppenheimer, who lost his security clearance following a highly publicized hearing in 1954. The stakes of that episode were relatively low, as Oppenheimer's primary position as director of the prestigious Institute for Advanced Study was never in peril. However, others were threatened with loss of employability and prison, and some left the US at the very moment it became a global leader in physics.

These fates were not meted out according to statutes and due process but rather through unrestrained use of investigative powers and embarrassment via the press. And those tactics were often used capriciously, discouraging defense of those targeted, lest the defender become a target too. Individuals and institutions varied greatly in their responses to such pressure. What we learn is that, while anticommunism was unquestionably a movement of ferocious power, scientific status could blunt that power, and accommodating anticommunism could come with steep costs of its own.

THE SMEARING OF EDWARD CONDON

Edward Condon was among the earliest and most prominent physicists to come under attack. A theoretical physicist and one of the first American experts in quantum mechanics, Condon shifted his focus to industry in the late 1930s as the head of a new program in fundamental research at Westinghouse Electric and Manufacturing Company. In 1945, Commerce Secretary Henry Wallace—a prominent left-wing Democrat and formerly the US vice president—persuaded President Truman to pick Condon to direct the National Bureau of Standards, a scientific agency in his department (now called the National Institute of Standards and Technology).[2]

Edward Condon. Photograph by Heka Davis, courtesy AIP Emilio Segrè Visual Archives, Physics Today Collection.

Condon's politics were unremarkably liberal. He likely became a target due to a series of mostly nonpublic events, beginning when he briefly became Oppenheimer's deputy at Los Alamos in 1943 and clashed with Brigadier General Leslie Groves over security constraints. After the war, Condon publicly advocated for scientific exchange with the Soviet Union, and he grappled with

US authorities while unsuccessfully seeking to go to Moscow to attend the 220th anniversary of the founding of the Russian Academy of Sciences.

Anticommunist partisans in Congress probably took notice of Condon due to Wallace's involvement with his nomination as well as Condon's behind-the-scenes opposition to legislation that would have given the military significant control over atomic R&D and imposed severe penalties for secrecy violations. As Jessica Wang detailed in her 1999 book *American Science in an Age of Anxiety*, the House Un-American Activities Committee (HUAC) began agitating against Condon soon after he became NBS director and in March 1948 released a report tarring him as "one of the weakest links in our atomic security."

However, the report really just presented vague insinuations about Condon's associations, and he was readily cleared by a Commerce Department security review. He recalled in a 1973 interview with AIP that his real difficulties came through how HUAC worked journalists:[3]

There were things coming out dramatically with the press, even with cameras to my house one evening to serve a subpoena on me for hearings.... But you know the way the press operates on a story that kind of continues and recurs: every time they reprint it they have to tell it all over again so the readers will know what they're talking about. So, what now ensued, all through the whole spring of '48, they just postponed the hearing for a couple of weeks, and every time the papers carried a notice that it was postponed, they'd put it in again about Dr. Condon who was called the weakest link in our security chain. So they got a hell of a lot of play over and over again.

At the same time, Condon was vigorously defended by members of the scientific community. The American Physical Society, American Association for the Advancement of Science, and National Academy of Sciences all issued supportive statements, cautioning that his treatment was harmful to American science as a whole. The newly established Federation of American Scientists advocacy group led a letter-writing campaign on his behalf, and many others independently wrote to Congress and President Truman. Some 150 scientists sponsored a dinner organized for Condon in April 1948 by another new high-profile organization, the Emergency Committee of Atomic Scientists.

Anticommunist lawmakers continued to target Condon periodically throughout his tenure as NBS director, which lasted until 1951, and even after he decamped for a position with Corning Glass Works. His security clearance was finally taken away in 1954, though he recalled in the AIP interview that he had little need of it by then. Notably, Vice President Richard Nixon claimed he was personally responsible for the move. Condon reflected, "Later, the secretary of the navy denied that Nixon had anything to do with it. These two guys squabbling over who should get the credit for this horrible thing!"

J. EDGAR HOOVER'S FRUITLESS PURSUIT OF EINSTEIN

Condon's leadership of a government agency made him an inviting target for anticommunist politicians looking to gain public attention, but there were some scientists who were so esteemed that they could not be smeared so cavalierly. In his 2002 book *The Einstein File*, Fred Jerome documented how FBI Director J. Edgar Hoover personally devoted significant attention to a highly secretive, years-long investigation of Albert Einstein without ever constructing a case he felt safe in taking public.[4]

Long before immigrating to the United States in 1933, Einstein had been an outspoken pacifist and advocated on behalf of socialism and humanitarian causes. In America, he lent his fame to the growing civil rights movement, and after World War II he campaigned for the control of atomic weapons as a leader of the Emergency Committee of Atomic Scientists and called for the establishment of a worldwide government.

Albert Einstein walking with Harlow Shapley. Shapley was the director of Harvard College Observatory and a political activist, who, like Edward Condon, was an early target of HUAC. AIP Emilio Segrè Visual Archives, Shapley Collection.

Further, Einstein criticized the rightward turn of American anticommunist politics and its strong-arm methods. In 1948, he told the Polish ambassador during a dinner party hosted by the Bulgarian minister to the US, "I suppose you must realize by now

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that the US is no longer a free country, that undoubtedly our conversation is being recorded. This room is wired and my house is closely watched." Jerome wryly noted that we know about the remark because the FBI did indeed record it and placed it in Einstein's file.

The FBI initially maintained a file on Einstein, as it did on numerous people, because of his left-wing political views rather than any suspicion he was engaged in specific illegal activities. However, in 1950 Hoover escalated the bureau's work on Einstein, directing agents to report all the "derogatory information" they could find on him. Around the same time, the US Immigration and Naturalization Service also asked the FBI for such information in the hope of stripping Einstein of his citizenship.

Even flimsy FBI evidence could fuel a smear campaign. For example, highly inconclusive information the bureau conveyed to the Commerce Department about Condon's associations was one of the things HUAC zeroed in on in attacking him. But Hoover understood that innuendo would not be enough to cast Einstein as a dangerous subversive.

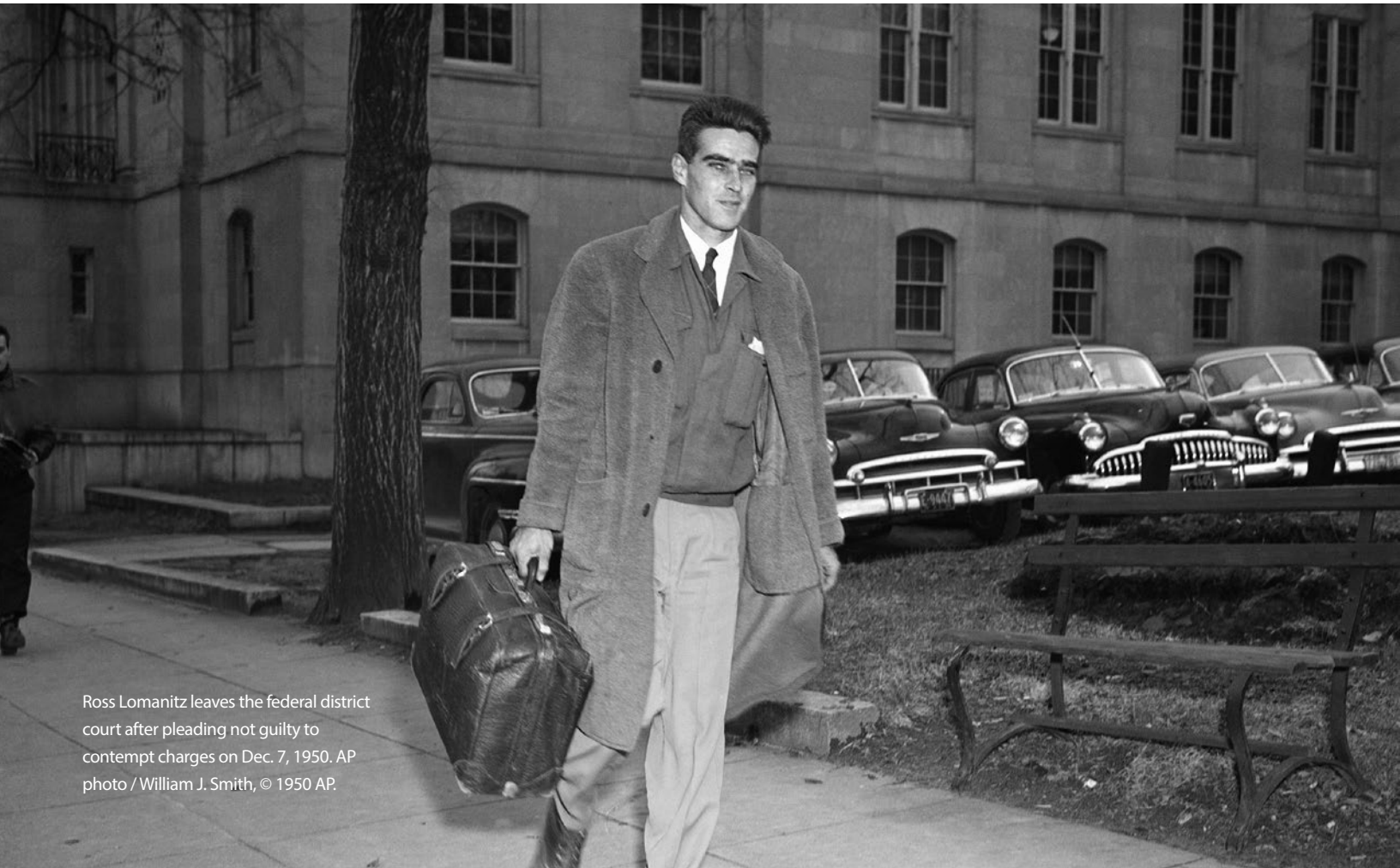
Hoover demanded stronger material but emphasized it should be gathered discreetly to avoid the international blowback that any news of the investigation would provoke. Agents were, for instance, forbidden from interviewing anyone close to Einstein. Instead, they spent their time following up on spurious leads about links to atomic spies and chasing after rumors, such as that Einstein's office in Berlin had been a hub of communist activity, or that he had a son, "Albert Jr.," who was being held hostage in the Soviet Union.

By 1954, the investigation had finally wound down without producing usable results. Einstein died on April 18, 1955, and Hoover's attempts to undermine him remained unknown until the FBI released his file decades later under the Freedom of Information Act.

THE VULNERABILITY OF LOWER-STATUS PHYSICISTS

Einstein and Condon were both protected from the worst consequences of the Red Scare by their strong positions within their profession and, of course, their lack of involvement in actual communist activities. Scientists without their standing or who had participated in more radical politics were less fortunate and variously found themselves interrogated, arrested, fired, and blacklisted. Even within Condon's NBS, employees were subject to dismissal. Condon recalled in his AIP interview,

When they began to fire people for allegedly being communists … that was done by a group in the Department of Commerce, and I didn't have anything to do with making any decisions about it.... But of course, since I'd had a lot of trouble, a lot of these



Ross Lomanitz leaves the federal district court after pleading not guilty to contempt charges on Dec. 7, 1950. AP photo / William J. Smith, © 1950 AP.

distressed people would come and see me, more as an individual or as a friend, to find out what they might be able to do or something.... A great big guy came in who'd... gotten a notice that he was being bounced for being a communist. He was in a towering rage, and he said, "I'm not a communist! I'm not a communist! I'm a Trotskyite!" I said, "That'll get you nowhere."

Despite his own exposure, Condon did invite to his house younger scientists who were subpoenaed from out of town to testify before Congress, offering them lodging, advice, and moral support. One of them, Ross Lomanitz, went to Condon's home following a 1949 HUAC hearing at which he had invoked the Fifth Amendment to avoid naming people he knew during his association with the local Communist Party in Berkeley, California. Lomanitz recalled in a 2002 oral history with historian Shawn Mullet that is deposited at AIP,[5]

I had never met the man before. I came to his home, and they were fairly solicitous about how we were doing, trying to relax and so on. Then of course the funny thing I remember is what I wanted then was a drink—preferably a scotch and soda, but anything would have done. And he and his wife were apparently completely oblivious to this aspect of the human animal, because they offered us apples. I liked them. I liked what I heard about them. I liked what I read about them.

Lomanitz had been one of a number of left-wing students who surrounded Oppenheimer at the University of California, Berkeley. The government barred him from participating in the Manhattan Project, and he was drafted into the military. After the war, when Oppenheimer became director of the Institute for Advanced Study, Lomanitz moved to Cornell University, where he was in the first group of students to earn a doctorate under Richard Feynman.

Following his HUAC appearance, Lomanitz was indicted for contempt of Congress. Though he was eventually cleared, his career was derailed. Fisk University, a segregated black university in Tennessee, withdrew a contract he had to teach there. Unable to find another position, he left physics and for a time did manual labor while living with his wife in a one-room shack. He only made his way back into the academic world a decade after his indictment.

Targeted figures such as Lomanitz were often subject to being sacrificed by their institutions. Reflecting on the situation Fisk President Charles Johnson was in, Lomanitz told Mullet,

He was the first black president of an all-black university whose claim to fame had previously been their chorus and who now had a chance perhaps to really make a giant leap. I guess he thought the last thing he needed was extra headaches and extra accusations of saying blacks and communists are linked together.... All the graduate students—who were black, and who had come there primarily because of the GI Bill of Rights on the one hand, and because of my coming there in theoretical physics and the Raman infrared program on the other hand—all of them came around and asked him to please continue this program, because they saw their own lives at stake. I can see Johnson's point of view, and I can also see their point of view.

David Bohm reading the newspaper after invoking the Fifth Amendment before the House Un-American Activities Committee. Acme Telephoto, New York World-Telegram and the Sun Newspaper Photograph Collection, Library of Congress, courtesy of the AIP Emilio Segrè Visual Archives.

Meanwhile, Oppenheimer proved willing to placate the US security apparatus by saying damaging things about his students. In a meeting with a security officer during the war, he labeled two of them, David Bohm and Bernard Peters, as "dangerous," adding that he regarded Peters as a "crazy person." Like Lomanitz, Bohm and Peters were called before HUAC in 1949. Bohm invoked the Fifth Amendment and was later arrested and acquitted; he lost his position at Princeton University and moved to Brazil, then Israel, and finally England. Peters had a less eventful encounter, and his institution, the University of Rochester, stood by him. Even still, frustrated by ongoing problems in gaining State Department clearance to travel internationally, he moved to India and eventually Denmark.[6]

THE BONFIRE AT BERKELEY

Far from standing by targeted faculty and students, some universities actively sought to reinforce the anticommunist campaign at

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the local level. Perhaps most notably, Berkeley became embroiled in controversy over a loyalty oath it required of its employees.

The university first instituted its oath in 1942, requiring a pledge to abide by the constitutions of the United States and the state of California, and then in 1949 it added a clause affirming nonmembership in the Communist Party. At that same time, HUAC alleged communist infiltration at the university's Radiation Laboratory (now Lawrence Berkeley National Laboratory), and David Fox, a Berkeley teaching assistant in physics, was fired after being called before the committee under suspicion of being a communist.[7]

Amid this atmosphere, resistance among Berkeley faculty members to the new oath hardened, and some refused to sign it, deeming it an infringement on their rights. In early 1950, the University of California Board of Regents allowed nonsigners to request a hearing to explain their refusal but also aggravated the issue by requiring an annual oath, undermining tenure protections. In June, the board voted to terminate 157 employees and 31 were ultimately dismissed, among them Harold Lewis, another of Oppenheimer's former students, and theorist Gian-Carlo Wick, who immigrated from Italy after World War II at the urging of Enrico Fermi.

Gian-Carlo Wick. AIP Emilio Segrè Visual Archives, Segrè Collection.

In addition to those fired, physicists Geoffrey Chew and Harold Wilcox resigned on principle, as did Jack Steinberger, who had come to the Radiation Laboratory a year earlier to work with Wick. Concern over the oath continued to weigh on other physicists. Wolfgang "Pief" Panofsky signed but left in the summer of 1951 after wrestling with his feelings on the matter. The controversy also contributed to Robert Serber's decision to leave at the same time.

If Berkeley had gained some superficial assurance of loyalty from those who remained, it paid a heavy price for it, losing every theorist on its faculty. Wick would go on to become head of the theory group at Brookhaven National Laboratory. Chew moved to the University of Illinois but did return to Berkeley in 1957 and advanced what was for a time the leading approach to understanding the strong force.[8] Panofsky, an experimental physicist, would become the founding director of SLAC. Steinberger would win the Nobel Prize for his work in experimental particle physics.

In 1952, the California Supreme Court deemed the new loyalty oath to be against the state's constitution, nullifying the requirement. The culling of Berkeley's physics faculty had been for nothing.

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2. On Condon, in addition to Wang, *American Science*, see Thomas Lassman, *Edward Condon's Cooperative Vision: Science, Industry, and Innovation in Modern America* (University of Pittsburgh Press, 2018).
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5. Interview of G. Rossi Lomanitz by Shawn Mullet on July 26, 28, and 29, 2001; and August 18, 2002, session 4, AIP, doi.org/10.1063/nbla.myeg.xrnt.
6. On the experiences of Oppenheimer's students, see Mullet's PhD dissertation, Shawn Khristian Mullet, "Little Man: Four Junior Scientists and the Red Scare Experience" (Harvard University, 2008). We recently spotlighted Peters's case in our Weekly Edition email newsletter, with a discussion of further sources: William Thomas, "Oppenheimer–Condon–Peters: Conscience, Coercion, and the Red Scare," May 16, 2025, aip.org/history/oppenheimer-condon-peters.
7. On the place of physics in the controversy, see David Kaiser, "Nuclear Democracy: Political Engagement, Pedagogical Reform, and Particle Physics in Postwar America," *Isis* 93, no. 2, 2002: 229–268, on 245–247, doi.org/10.1086/344960; and John David Jackson, "Panofsky Agonistes: The 1950 Loyalty Oath at Berkeley," *Physics Today* 62, no. 1, 2009: 41–47, doi.org/10.1063/1.3074262.
8. For more on Chew, see Kaiser, "Nuclear Democracy."

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AIP History

Q&A: THE DRAW OF HISTORY

It is difficult for us, the members of AIP's history team, to explain our interest in the history of the physical sciences without being tautological. It is our professional raison d'être, after all. But we always want to learn more about what kinds of appeal history can have for our primary stakeholders in the physical sciences community. Commemoration and fond memories are obviously important draws, and there is a common stereotype among historians that future-focused scientists have little interest in history beyond telling pat stories about their own achievements! Surely, though, there is, or can be, more to it.

Seeking nuance—and particularly a sense of what value history can have to younger scientists with a shorter personal stake in it—we reached out to two physicists who have shown a strong interest in the past. Bob McNees is a physicist who often posts well-informed history threads on the social media platform Bluesky. Yangyang Cheng is a physicist who has transitioned into a position at Yale Law School, where she researches and comments on US–China relations, including their historical dimensions.

ROBERT MCNEES

First, could you tell us a little about your work as a physicist?

I'm an associate professor of physics at Loyola University Chicago. We are an undergrad-only department, so I divide my time pretty evenly between teaching and research. My primary research interest is quantum gravity—I spend a lot of time thinking about black holes and holography.

How long have you been interested in the history of physics, and was there any particular historical work that inspired you to learn more?

My interest in the history of physics goes back to my childhood in Oak Ridge, Tennessee. The history of the town is closely tied to the history of twentieth-century physics, so growing up there exposed me to all sorts of stories about important scientists. Then, in college, I heard lots of stories and anecdotes from my physics professors. In both cases, this lore usually took the form of "great men" stories. Those stories can be exciting, but they paint an incomplete and unrealistic picture of how the field works. What eventually inspired me to learn more was becoming a professor and realizing that I was going to be the one sharing the stories and anecdotes. I wanted to show my students that a collaborative field like physics is built on many contributions from all sorts of people.

Photo courtesy of Bob McNees.

How do you decide what to post about, and where does the information in your posts come from?

I try to highlight scientists who made important contributions but might not be as well known to new students or folks with a casual interest. A general audience probably knows about Edwin Hubble, but they may not be familiar with Henrietta Swan Leavitt's work

on Cepheid variables. Sometimes I will focus on a scientist's lesser-known work. Everyone knows about Oppenheimer's role in the Manhattan Project, but they may not know about his early work on gravitational collapse. I draw from lots of sources—primary literature, books and articles about the history of physics, and stories I've learned from scientists and historians.

What do you feel is the value of knowing about the history of physics?

It's important, of course, for any working scientist to understand how their subject arrived at its current state. But my interest really grew out of teaching, where the value comes from helping my students see themselves in the field. Almost all the stories I learned as a student were about scientists I had lots in common with. Hearing those stories about people like me, doing the sorts of things I wanted to do, made physics feel very inviting. I want my students to have examples like that: scientists whose work advanced the field, who they can easily relate to, who sometimes dealt with problems and obstacles that might feel familiar. I want it to be just as easy for them to see themselves in the field as it was for me.

YANGYANG CHENG

Can you tell us a bit about your career arc?

I grew up in a medium-sized city in central-eastern China and came to the US in 2009 to pursue my PhD in physics at the University of Chicago. After working on the Large Hadron Collider for over a decade, I moved to my current position at Yale Law School, where my research focuses on the development of science and technology in China and US–China relations. Much of my current work is public-facing, so I am also interested in and work through the forms of narrative nonfiction, literary criticism, and audio storytelling.

I describe my career trajectory and my life in general as a series of border-crossings—across national, linguistic, political, and disciplinary boundaries. Crossing a border does not mean one leaves the old home behind. A migrant is constantly negotiating with the artificial divisions. And if there's one way to sum up my research interests, it is that my work interrogates the dynamics of science at the border.

How did you come to regard history as relevant to your work?

When I was a graduate student at the University of Chicago, my office overlooked the statue *Nuclear Energy*, which marked the site of the first nuclear reactor, constructed in 1942 as part of the Manhattan Project. So, the hauntings of history were always present. Later, as a postdoc at Cornell, I began writing for the public, and I started with issues in the headlines, such as how new technologies might be used for political repression in China and the restrictions on Chinese scientists in the US. Very quickly, I realized that in order to comprehend the present, I must turn to the past to grasp the concepts and conditions for not just how they are but how they came to be, the choices made and the roads not taken.

As a migrant who is politically alienated from her birth country, I also find studying Chinese history to be really important for me to stay true to myself and grounded in my cultural identity. On the other hand, learning about the history of each city I've lived in here in the US helps me feel connected to the place; even if it is a temporary dwelling, I feel part of a much longer, larger lineage of people who had similar struggles and harbored similar aspirations as I do. Finally, on that note, one aspect about history that is really crucial to my work is that I pay attention to not just state policy but the people: How did scientists generations before me navigate seismic shifts in geopolitics and ethical dilemmas? I find the personal experiences to be the most illuminating.

What can the history of US–China relations in science tell us about more recent developments?

One reaction I've often encountered from my colleagues in the sciences in light of recent developments is surprise, that the

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restrictions on US–China scientific collaboration feel like an abrupt shift from decades of encouraging exchange and are a gross betrayal of the cosmopolitan ideals of science. However, if one examines the long history of US–China relations in science and education, dating back to the nineteenth century, there are cycles of tightening and opening, accompanying profound changes in both countries and in geopolitics. This should, first of all, dispel the notion that science is global by nature and knowledge moves across borders by its own will. One should not mistake a worthy aspiration for reality. In reality, knowledge is enabled to move by people and institutions, and the production and exchange of scientific knowledge are always conditional.

Recognizing the conditional nature and the historical precedents does not mean one simply gives in to cynicism or despair. History also tells us that the future is not predetermined and the path is always contingent, and ordinary people can be agents of change. US–China relations had been worse before, at great cost to the people of both countries and beyond, and with lasting consequences for the development of science and technology globally. Lessons from the past can inform our current struggles and help us imagine a different, better future.

What are you working on right now? And given everything that is happening in US science this year, what do you think are the most important things to pay attention to?

I mentioned that my work "interrogates the dynamics of science at the border," so a primary area of my research is on the history of US–China academic exchange. But the border is not just the territorial bounds of nations. I also pay a lot of attention to the peripheries, to the people and places that are marginalized or caught in between systems of power. For example, I look at the gendered and racialized dimensions of scientific development in China and how they might differ from or echo situations in the US.

It is a very challenging year to be a scientist in the US, let alone being a migrant scientist of Chinese origin. It is, of course, important to watch the policy developments, but it is equally if not more important for members of the academic community and the general public to pay attention to the responses and think about how they themselves can take part, to fight for the future they want. To my colleagues in the sciences, especially the at-risk members, take care of yourselves and your loved ones, because there's a long struggle ahead. Identify people you can trust and be part of a community. Remind yourself of what inspired you to do the work you do and hold onto that. When it's easy to feel powerless, it is exceedingly critical to recognize the power one holds and learn how to leverage that through a collective.

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