Bulletin
of the
American
Academy
of Arts & Sciences

Why Does Science Matter?

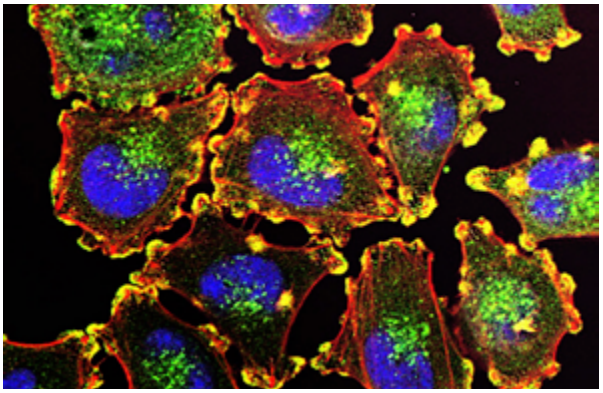
Featuring Rommie Amaro and J. Craig Venter in conversation with Peter Cowhey

SPRING 2026

SELECT

UPCOMING EVENTS

May



27 Virtual event

How Are AI & Science Shaping Discovery?

Featuring: **James Maynika** (Google-Alphabet), **Aviv Regev** (Genentech), and **Eric Topol** (Scripps Research)

June

3 The Century Association, New York, NY

New York New Members' Reception and Morton L. Mandel Conversation

Featuring: **Elizabeth L. Hillman** (National 9/11 Memorial & Museum)

June

11 University of Washington, Seattle, WA

Seattle Members' Dinner

Featuring: **Emily M. Bender** (University of Washington) and **Xuedong Huang** (Zoom)

October

9–11 Cambridge, MA

Induction Weekend

Visit amacad.org/events for more information about these and other upcoming events.

CONTENTS

Midjourney generated art by Kent Madsen, August 1, 2022

Features

CONTENTS

Our Work

Members

Departments

From the President

In January I had the opportunity to travel to London to participate in the continuation of one of the Academy's longest institutional relationships: our shared pursuit of knowledge with the Royal Society, the oldest scientific society in existence. The first interaction between our two societies occurred in 1785, when Royal Society member Benjamin Gale contributed to the first volume of the Academy's *Memoirs*. A few years later, in 1788, Royal Society President Sir Joseph Banks was elected a Foreign Honorary Member of the Academy.

As you will see in the pages that follow, what brought our two societies together on this occasion, nearly two hundred and fifty years later, was a convening of scholars, leaders, and policymakers to address a question at the front of many of our minds: What is the future of knowledge creation in this era of social, political, and technological disruption? And how can scholars – the creators of knowledge – maintain ties between countries when traditional political, economic, and diplomatic relationships are threatened?

Over the course of two days at the Royal Society's headquarters in London, we explored the concept of knowledge diplomacy, the process of building and strengthening relations between and among countries through international higher education, research, and innovation. Participants exchanged views on how knowledge diplomacy can help clarify the role of expertise, strengthen the foundations of knowledge exchange and public reasoning, rebuild trust, and restore the crucial role of knowledge as a public good in service to society. I came away from the meeting with a deeper appreciation of the many dimensions in which knowledge is under threat today, including through reductions in funding, the loss of data, reductions in future data collection, the decline in publicly motivated knowledge, and counternarratives about expert consensus.

This edition of the *Bulletin* explores a number of other ways that the Academy has been addressing the question of knowledge creation in uncertain and disrupted times. In November, the Academy's Berkeley Committee hosted an event to increase understanding of generative AI technologies, the recent lawsuits challenging their legality, and the implications for the legal system and the economy. In San Diego in January, the Academy's local committee partnered with the San Diego Natural History Museum to host a lively discussion on the question of "Why Does Science Matter?" – both today and in the future.

At the Academy's headquarters in Cambridge, we partnered with the Open Research Community Accelerator (ORCA) to convene an important meeting on modernizing tenure, asking the question, "how can we modernize academic reward systems to ensure a vibrant pipeline of new scholars, and better align research practices with institutional missions and the public good?" In another meeting at the Academy, we convened scholars, practitioners, journalists, and policymakers to assess the current state and future of security studies, a field being challenged by rapid shifts in global power dynamics, nontraditional threats, and emerging technologies. And in December we hosted a special convening – the first of its kind at the Academy – with representatives from community colleges to focus on enhancing skills development and employment outcomes for postsecondary students.

As I reflect on all of this activity, I am reminded of our January meeting in London and the imperative that emerged: to counter the threats we face in this turbulent era, we must recommit ourselves to using our networks – intellectual, social, economic, and political – to defend and reestablish the free creation and preservation of knowledge. We ourselves need to become knowledge diplomats – developing, recording, and sharing narratives about why and how we create knowledge, and the human lives that are improved as a result.

I hope you will enjoy the stories contained in this edition of the *Bulletin*, and I thank you for the stories that you as an Academy member continue to create through your life and work.

Yours cordially,
Laurie L. Patton

Advancing Skill Development and Employment Outcomes for Postsecondary Students

By **Molly Kent**, *Program Coordinator for Education*, and **Catherine Van Ness**, *Program Officer for Education*

Can community colleges and employers create skills-based credentials of value?

On December 18, 2025, the Academy held a convening to explore how to advance skill development and employment outcomes for postsecondary students. Chaired by **Bridget Long**, Harvard University Distinguished Service Professor, this day-long meeting focused on building and validating Massachusetts community college students' skills for careers in health care. For the first time in its history, the Academy convened leaders of local community colleges, including Bunker Hill and Quinsigamond Community Colleges, alongside researchers, education philanthropists, and representatives of Boston-area employers. The participants discussed how they can best prepare students for both work *and* life while providing support throughout their studies and ensuring that

their credentials remain flexible and transferable.

The convening builds on the ongoing work of the Academy's Commission on Opportunities After High School, chaired by **Nancy Cantor** (Hunter College), **Harrison Keller** (University of North Texas), and **Bridget Long** (Harvard Graduate School of Education). The commission is exploring all the paths available to students following high school graduation. One area of interest is the community college–to–career pathway. This line of work as well as this convening have been generously supported by Academy member **Robert C. Pozen**, Senior Lecturer at MIT, who provided both funding and thought leadership.

WHO ARE THE LEARNERS OF TODAY?

With a focus on historically underserved students, especially those with some college credit but no formal credential, the group underscored that the new majority learner is not a "traditional" student:

- 69 percent are working while studying;
- 30 percent are first-generation students; and
- 40 percent are older than 22.

The participants highlighted the many challenges students face when transitioning from high school to higher education and the workforce, such as financial hardship, balancing school with work and family responsibilities, and navigating uncertainty in a rapidly changing labor market. They emphasized the importance of on- and off-ramps and discussed how higher education can better support students in developing durable skills, earning microcredentials, and building bridges with employers.

WHAT ARE DURABLE SKILLS?

Durable skills, previously referred to as soft skills, are transferable, lifelong skills such as communication, teamwork, resilience, and critical thinking. Unlike technical or occupation-specific skills, such as coding, operating machinery, or financial management, durable skills are broadly applicable across roles and industries.

Durable skills are often seen as intangible and evolving, making them difficult to define or measure. Higher education lacks standardized methods for assessing and validating durable skills and signaling their value in the workforce. Although employers frequently emphasize the value of durable skills, their hiring policies and practices often continue to prioritize degrees and formal credentials. These challenges have contributed to the devaluation of durable skills and underscore the need for new forms of skill development and credentialing.

The participants emphasized that technical skills are a minimum qualification for employment, but candidates who can demonstrate strong durable skills would be more desirable employees.

WHAT IS A MICROCREDENTIAL?

To promote greater recognition of durable skill development in students, we need to change how both employers and the higher education sector perceive community colleges, positioning them as leaders in cultivating these essential skills. One way community colleges are innovating in this area is through microcredential programs, which allow students to earn a resume-building microcredential for a durable skill, such as teamwork or communication, by completing a few targeted courses rather than pursuing an associate or bachelor's degree.

One example of such a program in Massachusetts is Bunker Hill Community College's Skill Badge Program.[1] Administrators worked with faculty to identify existing course sequences that build

1. Bunker Hill Community College, Skill Badge Program, https://www.bhcc.edu/academics/divisions/humanitiesandlearningcommunities/humanitiestocareerprogram/skillbadges.

A key theme from the December convening was the value of effective collaboration between higher education institutions and employers, particularly in microcredential programs.

students' competencies in specific areas, such as conflict management. They also engaged local employers to help design a workplace simulation workshop aligned with those skills. The employers attend the workshop and provide students with feedback in real time. As a result, students graduate with a microcredential that both their college and future employer recognize as an important and marketable durable skill.

Microcredentials help students articulate and demonstrate their validated skills. They provide a shared language among educators, students, and employers, and create opportunities for more specific collaboration between higher education institutions and employers. This alignment has become increasingly important in today's rapidly evolving labor market, with uncertainty around AI and a fragile funding environment.

HOW CAN HIGHER EDUCATION BRING EMPLOYERS INTO THE CONVERSATION AS AN EQUAL PARTNER?

A key theme from the December convening was the value of effective collaboration between higher education institutions and employers, particularly in microcredential programs. The participants emphasized the value of gatherings like this, which bring together a diverse mix of institutions from various regions alongside employers of different industries, sizes, and levels of engagement with higher education. These convenings help leaders define how targeted programs, such as microcredentials or degrees, develop specific career skills and foster a shared language between higher education and employers. While convening higher education leaders and industry leaders can seem daunting, starting with small, regional, and industry-focused partnerships offer a lot of value compared with a one-size-fits-all national approach.

WHAT COMES NEXT?

At the conclusion of the convening, participants discussed goals for future work aimed at creating more effective pathways for students after high school by fostering greater collaboration between educators and employers. One area for potential future study is using intermediaries to develop quality programs, establishing shared definitions between educators and employers, and scaling beyond successful pilot programs. The participants encouraged higher education leaders to partner with industry associations, because many small- and mid-size employers are unable to dedicate staff resources to these kinds of partnerships. They also emphasized the need to continue documenting and collecting outcomes data from microcredential programs focused on durable skills in order to better understand their impact on students' future career prospects.

&

To learn more about the Commission on Opportunities After High School, visit www.amacad.org/project/opportunities-after-high-school.

Participants at the Academy's convening on skill development and employment outcomes for postsecondary students

Attendees gathered in the Royal Society's former library for the joint meeting on Knowledge Diplomacy, hosted by the Royal Society and the American Academy.

How Does Knowledge Survive?

By **Kate Carter**, *John E. Bryson Director of Science, Engineering, and Technology*

On a gray London morning in January, I walked past familiar markers of institutional gravity on my way to the Royal Society. Stone facades. Heavy doors. Plaques engraved with names that have outlived the controversies of their eras. It is easy, in places like this, to slip into a kind of historical reverence that feels comforting, even anesthetizing.

Inside, the atmosphere for the joint meeting on Knowledge Diplomacy hosted by the Royal Society and the American Academy felt weighted with a deep scientific history. The Royal Society's meeting rooms are ornate, with cherubs dancing across ceilings trimmed with gold leaf and intricate designs carved into wooden doors. I learned rather quickly that leaning too far back in my chair meant concussing myself on the larger-than-life marble bust of Henry John Stephen Smith, one of dozens of scientific greats observing our proceedings. At one point, a participant gestured around the room and suggested that it in itself embodied a kind of knowledge: scientific truth fused with artistic and human truth. It was a useful provocation, an argument about what a civilization looks like when it takes knowledge seriously.

The meeting, cochaired by **Mark Walport** (Foreign Secretary and Vice President of the Royal Society) and **France Córdova** (President of the Science Philanthropy Alliance), convened senior scientists, funders, diplomats, and institutional leaders from both sides of the Atlantic to grapple with a deceptively simple set of questions: How do we accumulate knowledge and use it? How do we evaluate knowledge and trust it? And can "knowledge diplomacy" help our countries navigate through what nearly everyone in the room described as a tipping point?

This was not the Academy's first collaboration with the Royal Society. The earliest recorded connection dates to 1785, when Benjamin Gale, a member of the Royal Society, contributed "Observations on the Culture of Smyrna Wheat" to the first volume of the Academy's *Memoirs*. Since then, the two organizations have worked together on efforts ranging from advancing discovery and strengthening scientific exchange to supporting peace.

It would be easy for a meeting this steeped in history to wield that history as a salve. Instead, the opening keynote presentations set a tone that was bracingly direct. A former frontline politician traced the arc of their own political career as a parable, recalling how they entered office at the turn of the millennium determined to champion evidence-based policymaking, especially around climate. Despite early progress and a body of climate evidence, however, the "facts gave way to factions" and the political will to act collapsed. Their country lost a decade of progress on climate policy.

WHAT HAS SHIFTED

That story – specific, rueful, and told without self-exoneration – set the tone for much of what followed. This meeting didn't treat the erosion of knowledge as an abstract structural problem. The room was full of people who had watched it happen, sometimes on their watch, and were trying to understand why.

The examples accumulated quickly. A senior diplomat described the Quebec Agreement, in which Churchill effectively used the knowledge generated by British universities as currency to support the Manhattan Project. This pooling of resources laid the foundation for a defense arrangement that still endures. The story was shared not as nostalgia, but as a reminder that knowledge has always been entangled with power, and that this entanglement has sometimes produced durable institutions.

Others offered less reassuring evidence. One participant described a national digital archive that seemed comprehensive and stable but was actually held together by licensing agreements that were impossible to trace and could change with little notice. Without any physical destruction, an entire collection could become inaccessible overnight.

The opposite scenario was equally alarming: retracted studies that continue to circulate through secondary databases, media coverage, and AI training data, so that corrections rarely eliminate the studies' influence. Self-correction remained an aspiration rather than a reliable mechanism – an ideal that worked reasonably well within contained expert communities, but whose limits become painfully visible once claims circulate rapidly. For much of the twentieth century, major scientific institutions occupied an implicit custodial role over these problems, not owning or fully controlling their circulation, but anchoring their legitimacy. That arrangement was never neutral; it reflected geopolitical power, disciplinary hierarchies, and exclusionary histories that determined whose knowledge mattered. Entire traditions of inquiry – indigenous, vernacular, or rooted in communities that did not speak through journals or academies – were

Royal Society and American Academy Collaborations

1785	Benjamin Gale's "Observations on the Culture of Smyrna Wheat" published in the Academy's *Memoirs*
1962	International Pugwash Conference
2012	Program on the Evolution of the Internet: Emerging Challenges and Opportunities
2014	Program on the Universe Is Stranger Than We Thought
2018	Program on Technology and the Future of Work
2026	Convening on Knowledge Diplomacy

Source: Data from the archives at the American Academy. Table created by Jen Gentili, Program Associate for Science, Engineering, and Technology at the Academy.

Knowledge diplomacy refers to the work of sustaining the conditions that allow knowledge to cross borders and be contested, corrected, and preserved, even under political instability and increasing fragmentation.

excluded from that custody. But for those inside the system, it created a legible center of gravity. That structural position has now eroded. No single actor today occupies the position or holds the authority that institutions once assumed was theirs.

WHAT KNOWLEDGE DIPLOMACY IS — AND ISN'T

Against this backdrop the discussion turned to "knowledge diplomacy." For a meeting largely focused on leading under uncertainty, it was perhaps reassuring that little time was spent trying to lock down a precise definition of knowledge diplomacy. What emerged instead was a practical understanding: knowledge diplomacy refers to the work of sustaining the conditions that allow knowledge to cross borders and be contested, corrected, and preserved, even under political instability and increasing fragmentation.

Participants were clear about what the concept was not. This was not a meeting about international scientific collaboration; everyone took that as baseline practice. It was not about putting more scientists into political office. And it was not about the growing political instability in the United States, though that reality was ever-present in the room.

During one break, several participants gathered around a laptop to read a transcript of President Trump's Davos remarks about Greenland. It was also hard to ignore that the only all-American panel on the program was titled "Knowledge Under Threat." Earlier, a speaker had recounted the fatal midair collision over the Potomac in January 2025 and President Trump's immediate suggestion that it was caused by diversity initiatives at the FAA. When reporters pressed him on the source of that claim, he replied, "Because I have common sense," which subsequent investigation did not support. Yet that very idea that common sense has authority over evidence represented in miniature the epistemological challenge the meeting had been convened to address.

Meeting cochairs **Mark Walport** (left; Royal Society) and **France Córdova** (right; Science Philanthropy Alliance).

THE MISMATCH

Despite the external tensions within this cathedral of science, the most urgent scrutiny turned inward.

During the COVID-19 pandemic and ongoing debates about climate change, scientific institutions were positioned not only as arbiters of evidence but as authorities of acceptable courses of action. Yet, as participants acknowledged, the questions being asked were never purely epistemic. They involved tradeoffs among competing goods, distributional consequences, and time horizons stretching well beyond the evidentiary record. Science can generate probabilistic claims about likely outcomes. But it cannot, on its own, determine which risks are tolerable, which harms are acceptable, or whose losses should be prioritized. When institutions are expected to supply these answers, disagreement begins to look like failure, revision as incompetence, and uncertainty as weakness.

Participants went a step further, asking how much institutions themselves had contributed to this mismatch. The expectation that science could deliver certainty on contested public questions was not imposed entirely from the outside; it was also cultivated, sometimes eagerly, by institutions that benefited from the authority such certainty seemed to confer.

This tension surfaced most clearly in a sustained argument about COVID-era decision-making. One participant pointed to school closures as a case in point, in which aggressive public health positions in parts of the United States demonized countries like Sweden without honestly examining the tradeoffs between two deeply imperfect options. The phrase "following the science" was invoked repeatedly in contexts in which the science was genuinely ambiguous and what was really at stake was a political judgment about whose suffering should be prioritized.

Another participant pushed back. In a crisis, leaders cannot say, "We're not quite sure, but maybe stay home." They have to act. The fault comes afterward, when inquiry commissions spend years assigning blame for decisions that had to be made in real time with incomplete information. A third voice cut through the exchange. They argued that the real issue was the failure to distinguish facts from values, and the tendency of scientists to present a mix of both as though they were entirely factual. Openness in research is both an evidence-supported practice and a value commitment. Diversity in science is both methodologically sound and a moral position. When scientists convey something to policymakers that reflects their own beliefs, the resulting confusion can cause real damage. The community senses the mixture, even if the messenger does not acknowledge it.

A former frontline politician responded with unusual candor. There was a risk, they said, that science would end up bundled with a set of progressive cultural positions that large segments of the public had come to distrust. Not because the positions were wrong, but because they were associated (whether fairly or not) with societal elites whose values had been pushed too far and were not shared by ordinary people. If science became associated with that bundle, it would inherit the resulting backlash. Several participants noted, with evident discomfort, that the war on science might be coming not only from outside. It could also come from within: from academic cultures that had not reckoned honestly with how they were perceived.

William Press (left; University of Texas at Austin), **Aisling Conboy** (middle; Wilton Park), and **Laurie Patton** (right; American Academy).

WHO BEARS THE COST

A system built for internal self-correction is now being asked to perform legitimacy in real time, at a planetary scale. And the burden is not shared equally. Early-career scholars often experience international collaboration, data sharing, and public-facing work as a personal exposure rather than as an institutional opportunity. Their professional standing, visa status, and future employment opportunities can hinge on decisions over which they have little control. Scholars working in politically sensitive contexts routinely face reputational

and political risk, often without reciprocal protection from the institutions that benefit from their work. When these institutional safeguards weaken, individuals end up absorbing the shocks.

A participant working in global health made the point more concrete. About 1 percent of the world's population has epilepsy. Seventy-five percent of these cases can be treated with a drug that costs twenty-five cents a day. Yet 80 percent of those affected are undiagnosed. Here is a case in which the scientific knowledge already exists and the treatment is inexpensive, but what is missing is the institutional scaffolding to move it from the laboratory to the people's lives it could change. If knowledge diplomacy cannot address that kind of gap, one participant asked, then what exactly is it for?

STEWARDSHIP, NOT OWNERSHIP

If institutions can no longer plausibly claim comprehensive guardianship over knowledge, what role remains? The discussion kept returning to the stewardship of conditions that is shaping the environments in which knowledge can be produced, challenged, preserved, and corrected without placing disproportionate risk on the most vulnerable participants.

In practice, this means confronting infrastructure that was never designed to serve as a long-term public good. Data repositories, publishing platforms, and digital archives increasingly operate within commercial arrangements that are accountable primarily to shareholders, not to the epistemic durability of knowledge. It means grappling with incentive systems that reward speed and novelty over maintenance. Careers advance by producing new findings, not by curating datasets or sustaining repositories. Funders support innovation over upkeep. As a result, the work of sustaining knowledge infrastructure becomes professionally peripheral even as our dependence on that infrastructure grows.

The actors shaping how knowledge circulates are increasingly private, transnational, and largely unaccountable to the public.

And it means making risk visible and collective rather than implicit and individual, asking not only whether a collaboration is scientifically valuable, but who bears the downside when conditions change. None of these challenges fall neatly under the authority of any single institution. Knowledge diplomacy, in this sense, is less about representing national interests abroad and more about building durable channels through which institutions can share responsibility and act collectively when unilateral action is insufficient.

WHAT RESISTS RESOLUTION

During the meeting, the problem of speed came up repeatedly. Many of the infrastructures on which knowledge now depends operate at tempos far faster than scientific institutions can move. Software updates, platform policies, export controls, and political alignments can shift in weeks, a pace very different from that of academic governance. A senior diplomat who had worked in both the private sector and government observed that in consulting, you might have three months to study a problem; in government, you are lucky to get three days, and often you only have three hours. Governments do their best with the knowledge available, but that knowledge is almost always incomplete. The takeaway was not that speed is impossible, but that institutions designed for deliberation will need to learn which decisions can wait and which cannot.

Concerns over authority were equally pressing. If no single institution occupies a central custodial position, who has standing to convene, set norms, or call out failures? National academies retain symbolic influence, but they have limited formal authority over publishers, funders, and private platforms. One participant compared major technology companies to the Roman Catholic Church in the Middle Ages: immensely wealthy, operating across borders, and capable of looking into your soul. Whether that metaphor felt hopeful or alarming depended on your perspective. But the underlying point was serious: the actors shaping how knowledge circulates are increasingly private, transnational, and largely unaccountable to the public.

The tension was palpable between openness and protection. Scientific exchange has traditionally relied on norms of openness and replication. But geopolitical volatility and national security concerns increasingly shape how knowledge moves. A participant involved in the AUKUS submarine collaboration explained that unlocking the scientific potential of the agreement required first convincing the administration to loosen security restrictions on American research. Even within an alliance, and on an issue of shared strategic interest, openness had to be fought for. If that is what it takes among allies, the prospects for broader scientific exchange deserve sober assessment.

Underlying all of it is a more subtle discomfort: knowledge diplomacy requires institutions to operate in explicitly political environments while maintaining commitments to epistemic rigor. Though that balancing act is not new, institutions are no longer operating against a background of assumed stability. Their choices are interpreted, contested, and amplified in real time.

THE TRANSLATOR PROBLEM

A recurring frustration concerned the distance between what scientists know and how that knowledge reaches the public. One participant noted that they had grown up in an industrial town with a healthy skepticism about what politicians and newspapers were saying, a skepticism rooted in lived experience. That kind of critical discernment is harder to cultivate in an information environment in which people select from billions of sources shaped by algorithmic bias. Teaching children to be healthily skeptical without becoming cynical, they suggested, was one of the most important and least discussed challenges facing democratic societies.

Others pushed the criticism inward. One participant argued that scientific publishing is frustratingly wary of drawing out policy implications. Papers proudly claim innovations in methodology that no lay reader can assess, then offer cavalier observations about implications in a final paragraph. The entire system of rewarding research excellence (e.g., incentives, prestige structures, and career logic) seems designed to produce knowledge that stops one step short of being useful to the people who need it. If knowledge diplomacy means anything, it must include reforming how knowledge is packaged for the world it is supposed to serve.

LEAVING THE ROOM

The Royal Society, much like the American Academy, offers a reassuring sense of continuity. These institutions have endured wars, political upheaval, and technological revolutions – countless moments when knowledge was threatened.

What feels different now is not the presence of conflict itself, but the architecture within which it unfolds. Custody of knowledge is fragmented, circulation is accelerated, correction is uneven, and authority is diffuse. The threats to science in 2026 are real and existential.

If knowledge diplomacy means anything, it must include reforming how knowledge is packaged for the world it is supposed to serve.

But the meeting also surfaced a harder question, one that the institutional register of "knowledge diplomacy" can make easy to avoid: whether the best response to these threats is to become more diplomatic, or to become more scientific. Diplomacy is about managing relationships between powers. Science is about producing truths that do not answer to power at all. Over the past several decades, the gravitational pull of institutional life has tugged science steadily toward the first posture, toward consensus-building, stakeholder management, strategic communication, the careful navigation of funding landscapes and political sensitivities. Participants acknowledged the necessity of that posture, but more than one mourned something lost in the process. There is a part of science that is rebellious, a part that takes comfort in being disruptive, unpopular, and ungovernable in the service of what the evidence actually shows.

Some of what has fragmented, such as the concentration of epistemic authority in a narrow set of institutions, languages, and geographies, was itself a form of fragility masked as order. Science that is genuinely revolutionary, that challenges its own biases as ruthlessly as it challenges external dogma, that serves people rather than prestige, is harder to attack than science that looks like one more arm of the establishment. The vulnerability the meeting diagnosed is real, but the remedy may not be better institutional architecture. It may be recovering the intellectual fearlessness that made these institutions worth building in the first place.

Carved above the entrance to the Royal Society are the revolutionary words *Nullius in verba* – take nobody's word for it. Not the king's. Not the church's. Not your own institution's, if the evidence says otherwise. If knowledge diplomacy is to mean anything durable, it will need to honor that spirit: not the careful management of what science communicates to the world, but the fierce, ungovernable commitment to discovering the truth. Even when it is unwelcome. Even when it is costly. Even when everyone in the room would prefer something more diplomatic. &

Modernizing Academic Appointment and Advancement

By **Gates Palissery**, *Hellman & Simons Fellow in Science and Technology Policy*

Anti-intellectualism is on the rise, fueled in part by attacks on institutions of higher education. As a result, the public has begun to question the role these institutions play in society and whether they still provide the value they once did. For decades, colleges and universities have claimed to advance the public good, pointing to their research contributions as evidence of their value and their continued need for public support. Their internal processes, however, do not always reflect their commitments.

Reward, promotion, and tenure (RPT) systems, in particular, often appear misaligned with the goal of maximizing the public good. Traditional measures of research productivity, such as citation metrics, publication counts, and grant funding, reinforce narrow definitions of academic excellence. Although universities frequently highlight community-engaged scholarship in their mission statements, this work is typically categorized as "service" in RPT evaluations and is often undervalued compared to research and teaching.

The Academy, in partnership with the Open Research Community Accelerator (ORCA), hosted a convening on November 5–6, 2025, to consider this misalignment. Led by **Ben Vinson III** (Harvard University), the meeting assembled leaders from across higher education to explore how RPT systems might better align with university mission statements and the public good.

The participants largely agreed that defining and evaluating scholarly achievement is a key component to reforming RPT systems. Although peer review is regarded as the gold standard, not all scholarly work undergoes traditional peer review. For example, new technologies may be clinically validated without being peer-reviewed. Similarly, work such as developing standards, dashboards, or databases; securing patents; and contributing to textbooks often falls outside peer review processes. As a result, some

participants questioned whether peer review is the most effective way to evaluate scholarly achievement.

The most sustained discussion during the convening focused on institutional culture. Although RPT systems vary across institutions, participants agreed that meaningful reform would require faculty-led cultural change, supported by visible and sustained commitment from university leadership. Some participants suggested that eliminating tenure altogether could catalyze the desired cultural change and encourage innovative and creative research. Others expressed concern about the implications for academic freedom without the protections tenure affords. A few participants noted that non-tenure-track faculty also go through reward and promotion processes and must be included in reform efforts.

The conversation about institutional culture continued, with some participants expressing their desire to see universities clearly define and support public engagement. Doing so would encourage, and ideally reward, faculty who seek to bridge the gap between their institutions and their communities. It would also broaden what "counts" as research (an important consideration given the current cuts to research funding) and expand the types of work within the traditional service category in RPT evaluations.

Mentorship was also highlighted as an important consideration in reforming RPT systems. Participants suggested that definitions of mentorship could be expanded to include senior faculty mentoring junior faculty. Some participants also stressed the importance of recognizing, if not formally rewarding, the often invisible work faculty do, particularly those from diverse backgrounds who mentor students from similar backgrounds, regardless of their research field.

Participants had differing views on how to engage with tenured faculty who may resist changes to RPT systems. Suggested approaches included implementing post-tenure reviews and encouraging intergenerational knowledge exchanges between senior and junior faculty members.

Reforming RPT processes will require time and institutional change, but some steps can be taken immediately. Institutions can set clear expectations for faculty early on, soon after hiring, and collaborate with them to align their work with their career advancement goals. A database of RPT materials, reform examples, and case studies across institutions could support these efforts.

RPT systems should be nimble and responsive, adapting to the tumultuous times we live in. The ideas discussed at the meeting will inform future work. The Academy is planning a series of virtual roundtables on professional societies, industry partnerships, and tenure practices in international contexts to translate these insights into concrete recommendations. &

Meeting participants **Greg Tananbaum** (ORCA), **Brandon Ogbunu** (Yale University), and **Gilda A. Barabino** (Olin College of Engineering)

The Future of Security Studies:
Toward a Resilient and Robust Field

By **Kaitlin Peach**, *Raymond Frankel Nuclear Security Policy Fellow*, and **Mitch Poulin**, *Program Associate for Global Security and International Affairs*

The field of security studies has long been defined by great power politics, interstate conflict, and traditional military threats.[1] However, shifts in the global balance of power, the rising influence of non-state actors, and the increasing urgency of nontraditional threats – such as climate change, infectious disease, biological weapons, and the risks associated with artificial intelligence – are challenging key assumptions in the field. In addition, security studies institutions are facing major funding cuts as U.S. government support for academic research and foundation support for security studies decline.

These challenges are prompting security studies scholars and programs to ask several pressing questions: How can the field be sustained and strengthened? How can security studies remain prepared to address current and future challenges, without becoming overly focused on the crisis of the moment? How can the field remain resilient amid funding constraints? And beyond reflecting on how the subject is taught, how should scholars best communicate their research to policymakers to maximize real-world impact?

On December 4 and 5, 2025, the Academy convened a Future of

1. Security studies is a subfield of international relations. The boundaries of what constitutes security are not always clear. The field emerged at the end of World War II and has typically been defined by issues of that era, such as military conflict, grand strategy, and deterrence. Over time, the field has expanded to include terrorism, cyber threats, and, more recently, human security issues like climate change, disease, and migration.

The field of security studies has long been defined by great power politics, interstate conflict, and traditional military threats. However, shifts in the global balance of power, the rising influence of non-state actors, and the increasing urgency of nontraditional threats – such as climate change, infectious disease, biological weapons, and the risks associated with artificial intelligence – are challenging key assumptions in the field.

Security Studies exploratory meeting, chaired by **Rose McDermott** (Brown University), **Scott Sagan** (Stanford University), and **Jennifer Welsh** (McGill University). The Academy has long been a leader in the field through its Committee on International Security Studies.[2] The meeting brought together an interdisciplinary group of scholars and practitioners to reflect on the field's trajectory and its ability to address both near- and long-term security challenges. Participants also identified key topics and research questions related to today's most pressing security issues.

BUILDING THE FIELD

The field of security studies emerged after World War II, with a primary focus on armed conflict and threats to state security. Scholars developed foundational theories to explain the causes of interstate war, the dynamics of escalation and crisis management, and – with the proliferation of nuclear weapons – the possibilities for nuclear deterrence. Over time, the field expanded to include topics such as human, environmental, and health security to reflect a broader understanding of both traditional and nontraditional threats to states and individuals. Alongside this substantive shift has been a growing recognition of the role that ethics and law play in shaping how threats are addressed and managed.

One of the meeting's key themes was the persistent "pipeline" problem in security studies: How can the field ensure a strong and sustainable pool of expertise? The participants highlighted three primary factors that are contributing to the shortage of expertise.

First, like many academic disciplines, security studies is facing a funding squeeze that makes it difficult for scholars to conduct research and to recruit and support new students. Postdoctoral positions are especially critical, as they help train early-career scholars to develop cutting-edge expertise and learn how to connect their academic research to policy debates. Today's challenges reflect both sudden and longer-term shifts in the funding landscape. Recent disruptions include the cancellation of federal grants to researchers and universities, such as the Department of Defense's Minerva Research Initiative that was terminated in 2025.

Longer-term changes include a shift in funding priorities away from traditional security issues, such as nuclear security and arms control, toward emerging security challenges like climate change, health security, and migration. Additionally, several major funders of nuclear security research have stepped away. For example, the MacArthur Foundation has discontinued its funding, and the Stanton Foundation has ceased operations, removing another source of support.[3] Yet there are some positive developments: the federal government has reinstated some grants, and the Consortium to Reduce Nuclear Dangers recently awarded $5.4 million to twelve projects selected from a pool of five hundred applicants.[4]

A second challenge concerns the field's ability to maintain a diverse pipeline of scholars and practitioners with expertise in a range of topics and areas. Students often focus on topics they see as urgent, but universities may offer fewer courses in these areas. As a result, some subjects remain underexplored, only to reemerge later

2. For more on the Academy's Committee on International Security Studies, visit https://www.amacad.org/project/committee-international-security-studies.

3. The Stanton Foundation, https://thestantonfoundation.org.

4. Carnegie Corporation of New York, "Consortium to Reduce Nuclear Dangers Announces First Round of Grant Awards and Welcomes New Partner," January 29, 2026, https://www.carnegie.org/news/articles/consortium-to-reduce-nuclear-dangers-announces-first-round-of-grant-awards-and-welcomes-new-partner.

as pressing issues.[5] For example, during the Cold War, there were many experts and scholars knowledgeable about nuclear weapons and strategic studies. By the early 2000s, as terrorism dominated the headlines and counterterrorism became a primary focus of national security strategies, the number of people with that expertise declined. Today, nuclear weapons are again playing a central role in international politics, but there are fewer scholars equipped to analyze what's happening and to help inform policy.[6] Participants emphasized the importance of continuing to nurture generations of talent across a broad range of topics.

Today, nuclear weapons are again playing a central role in international politics, but there are fewer scholars equipped to analyze what's happening and to help inform policy.

Third, security issues cross disciplinary and geographic boundaries, and require expertise in both technology and policy. To address this, the field needs to explore ways to better integrate and collaborate with scientists, including social scientists from other disciplines. Too often, as participants noted, the current research incentives trap students in disciplinary silos, limiting their ability to approach problems systemically and holistically. For example, students studying nuclear relations between two states also need to understand how other parts of that relationship, such as those involving economic issues, can influence the likelihood of conflict or cooperation.

KEY RESEARCH QUESTIONS

Despite these challenges, participants noted the growing body of research on current and emerging security issues. This research includes topics that cut across both traditional and emerging subfields. They emphasized that existing theories, methods, and institutional arrangements – and the researchers who use them – must adapt to address today's new security environment.

5. Yuriy Gorodnichenko, Ilona Sologoub, Tatyana Deryugina, and Analytics Society, "Why Russian Studies in the West Failed to Provide a Clue about Russia and Ukraine," Vox Ukraine, June 21, 2023, https://voxukraine.org/en/why-russian-studies-in-the-west-failed-to-provide-a-clue-about-russia-and-ukraine.

6. Bryan Bender, "The Dangerous and Frightening Disappearance of the Nuclear Expert," POLITICO, July 28, 2023, https://www.politico.com/news/magazine/2023/07/28/nuclear-experts-russia-war-00108438.

Participants at the Academy's exploratory meeting on the Future of Security Studies.

New Security Challenges

Participants noted that many emerging threats do not fit neatly into traditional, Cold War – era security frameworks focused on great power rivalry, territorial defense, and nuclear deterrence. Today's security environment is shaped by a new distribution of power – among both states and non-state actors – and by threats in domains where conventional security models often fail to provide guidance.

In one session, experts in computer science and epidemiology explained that AI-powered military technologies and biological weapons differ from conventional weapons because they are easier to access and they make it harder to identify the source of the threat. Discussants considered how traditional deterrence theories might apply to these threats, while also noting where these modern threats challenge traditional models of threat escalation and call for new oversight mechanisms and theoretical approaches.

Many participants highlighted underexplored emerging threats in the international political economy, such as the development of and access to critical minerals, semiconductors, batteries, and renewable energy sources, as well as the race to shape industrial and labor policies. They stressed the need to examine how private-sector technological advancements are reshaping the relationship between states and corporate actors in international security. Participants also noted that uncertainty about the evolution of some technologies – and their impact on geopolitical rivalries – remains a persistent challenge in today's security studies field.

Leadership Psychology

Another key theme from the discussion was how leaders perceive risk, access and process information, and make decisions under uncertainty. Some participants questioned whether realist narratives, which assume self-interest and rationality, adequately account for the behavior of contemporary personalist leaders. Others highlighted the influence of ethics and values in shaping leaders' choices. Many expressed a desire to better understand and incorporate insights from psychology and organizational dynamics, as well as in studying case studies of historical crises more deeply. Several suggested that political scientists collaborate with psychologists, despite constraints such as the "Goldwater Rule," which restricts public statements about the mental health of public figures. Others emphasized the importance of understanding how AI is transforming leaders' cognition and decision-making processes.

Domestic Politics, Democracy, and Governance

Participants emphasized the role of domestic politics in shaping foreign policy, especially in democratic societies. They agreed that internal threats to democracy, including rising political polarization, can significantly influence how states assess and respond to security challenges. Some pointed to the erosion of personnel and institutional capacity within the U.S. government and called for more research on the security implications of these disruptions. They also stressed that global security experts have a key role to play in restoring and strengthening expertise and transparency in government institutions.

The Need for Clear Communication

Throughout the meeting sessions, participants returned to the question of how to communicate complex security concepts to non-academic audiences, such as policymakers and students. Many agreed that, to have the most impact, scholars should think like academics but avoid academic jargon. Some recommended that in addition to publishing in academic journals, scholars should engage wider audiences through blogs, podcasts, and social media. Participants also expressed an interest in engaging with diverse and interdisciplinary perspectives as a way to develop a more comprehensive set of models that can help students and policymakers reason systemically about emerging economic, technological, and socio-political issues.

Former U.S. Ambassador to China Nicholas Burns speaks about the role of security studies in the future of U.S.-China relations.

CONCLUSION AND NEXT STEPS

The questions raised at the Academy's meeting on the Future of Security Studies highlighted that the field is at an inflection point. Keynote lectures during the meeting by *New York Times* reporter David Sanger and Ambassador Nicholas Burns (Harvard University) underscored that these questions are crucial not only for academics but also for policymakers. With funding shrinking and security threats rising, participants agreed that the field must update its frameworks and overcome disciplinary silos to meet current and future challenges. The research questions raised during the meeting provide a roadmap for a more adaptive and collaborative approach. Addressing them will ensure the field's relevance and empower scholars to help society navigate an increasingly complex global security environment.

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The Future of Security Studies exploratory meeting was made possible by the Raymond Frankel Foundation. For more on the Academy's work in security studies, visit https://www.amacad.org/topic/global-affairs.

Generative AI Is Terrific, But Is It Really Legal?

A Morton Mandel Conversation | 2140th Stated Meeting |
November 10, 2025 | Chevron Auditorium, International House at UC Berkeley

The Academy's Berkeley Committee hosted a panel discussion on generative AI (GenAI) that offered a technical overview of the technology and explored the legal and economic issues raised by the growing number of lawsuits challenging the legality of GenAI. The panel included **Jennifer Chayes**, Dean of the UC Berkeley College of Computing, Data Science, and Society; **Pamela Samuelson**, Professor of Law at UC Berkeley School of Law; and **Abhishek Nagaraj**, economist and Associate Professor at the Berkeley Haas School of Business. **Goodwin Liu**, Chair of the Academy's Board of Directors, delivered welcome remarks. An edited transcript of the panelists' presentations and discussion follows.

Théâtre D'opéra Spatial, an image made using generative AI

Jennifer Chayes

Jennifer Chayes is Dean of the UC Berkeley College of Computing, Data Science, and Society; and Professor of Electrical Engineering and Computer Sciences, Information, Mathematics, and Statistics at the University of California, Berkeley. She was elected to the American Academy of Arts and Sciences in 2014.

It's a pleasure to be here. I've been asked to talk about some of the technical aspects of generative AI technologies and to highlight some of the opportunities of these technologies.

GenAI is a game-changing technology. We saw a real breakthrough with what we call the transformer model, which is basically a model that allows us to look at words in a sentence to understand their relationships and context. Unlike older models that processed words one by one, this model processes sequences of words all at once. The transformer model has an encoder-decoder architecture: the encoder takes "tokens" (words) and converts them into vectors. And the decoder takes vectors and converts them into tokens (words).

I think somewhere between ChatGPT 2 and 3 there was a phase transition, analogous to a change of phase in a physical system like water freezing to ice, beyond which these

large language models (LLMs) could now extract information from the remote parts in the system. It seemed like magic because the LLMs could connect with remote information. We later moved beyond simple LLMs to multimodal models that include images, audio, and video.

Another breakthrough that helped to prevent some of the hallucinations was the use of reinforcement learning. Even as a user of the technology, you could mitigate hallucinations by carefully prompting these models. For ChatGPT, in areas in which it doesn't have that much knowledge, if you're very careful, you can lead it through prompts like you would lead a child learning how to add or multiply. And then it does a lot better. Some improvements are the result of inference-time compute, which is the extra computational power used after an AI model is trained, allowing the model to draw inferences to improve its problem-solving. And that made it a lot more reliable in many technical domains.

In pretraining LLMs, the system follows scaling laws. Performance improves exponentially as we increase the model and dataset size as well as the number of compute hours used for training. But the gains from pretraining are slowing down; we are seeing diminishing returns. When pretraining an already robust model, you need to feed in more and more information, and you get smaller and smaller improvements. You need much more data and many more parameters and that takes a lot of compute time. Basically, you're using more power to get incremental improvements.

In post-training LLMs, you feed extra information into the model. The more specific you are and the more you teach it, the better the answers will be. Reinforcement learning was also used to make these models safer. We are post-training LLMs with real feedback.

Now the goal of diffusion models is to generate something that doesn't exist. For example, let's say I want a painting of my cat in the style of a van Gogh. Many online apps can do this for me. How do they achieve this? They follow three steps. First, they add random noise (what we call a diffusion process) to an image of a van Gogh painting by knocking out pixels at random. Second, they reverse the process (what we call backward diffusion or denoising) to undo that random addition of noise and recover the original photo of the van Gogh painting. They do this by constructing a neural network that can denoise the image. And third, they take a random image and "denoise" it by using the backward diffusion process in step 2 to generate something entirely new. Obviously, for all of this we need to be aware of the copyright implications, which Pam will talk about later.

A few years ago, I met Omar Yaghi, who recently won the 2025 Nobel Prize in Chemistry. He told me that it took between two and three years to synthesize metal-organic frameworks (the discovery that earned him the Nobel Prize). I thought we should try to use AI to synthesize these materials. We received a gift to do this work at the Baker Institute of Digital Materials for the Planet. The great thing about these metal-organic frameworks is that they can capture and store toxic gases, and even harvest water from desert air. We started working together, and our group includes Christian Borgs and many postdocs and graduate students. We developed seven specialized LLM agents that took the synthesis time down from two to three years to less than two weeks. This work blew us away. And then we added a diffusion model to the LLMs, but instead of painting van Goghs, it imagined new molecules and materials and helped us to identify certain properties in these molecules and materials so that we were able to start generating them. This work was a very close collaboration between domain experts and experts in AI.

Let me end with this thought. I believe deeply that GenAI is the most empowering technology of our lives. But we must mitigate its harms and find ways that it can be used for good in leveling the playing field among people with different resources. I am working with a group at Berkeley and UCLA to create a curriculum for the community college system in California, which has 2.1 million students, that includes a module that teaches students both how to interrogate the output of GenAI and how to train an AI agent to enable students to effectively have their own research assistants, independent of their financial resources. We both mitigate the ill effects and enable the democratizing effects of AI. My collaborator at UCLA is Safiya Noble. She's a MacArthur winner, and she studies the ill effects of social media.

It's clear that we need collective expertise across disciplines. You cannot do anything without disciplinary expertise. It's wishful thinking for anyone who says that they can do this without deep collaboration with the experts. So what should we do? We need new levels of engagement with industry, academia, government, and civil society. We also need open source models, open weight models, testbeds, and frameworks that support fairness, accountability, and innovation. A lot of that was the subject matter of a report that we did for Governor Newsom on how we can mitigate some of the harms of GenAI while not forgetting about the potential upside of this technology. Thank you.

Pamela Samuelson

Pamela Samuelson is the Richard M. Sherman Distinguished Professor of Law and Information at the University of California, Berkeley; Professor at UC Berkeley's School of Information; and Codirector of the Berkeley Center for Law & Technology. She was elected to the American Academy of Arts and Sciences in 2013.

As of late 2024, nearly 40 percent of the U.S. adult population uses generative AI for work or for personal reasons, and this is at a rate faster than PCs and the internet. GenAI has become part of the infrastructure of our lives.

I'm going to talk a little bit about the lawsuits challenging GenAI systems. Generative AI is the fastest adopted technology, as compared with other computer and internet-related technologies. As of late 2024, nearly 40 percent of the U.S. adult population uses generative AI for work or for personal reasons, and this is at a rate faster than PCs and the internet. GenAI has become part of the infrastructure of our lives.

There are billions and billions of works on the internet that are being used as training data, as well as other forms of data that are being used to train these models. But many people who voluntarily put information up on the internet didn't expect that somebody was going to come along and scrape all this information and then use it for the purpose of training models for these generative AI systems. Many of the lawsuits are actually what are called class-action lawsuits, in which a small number of individual authors or copyright owners say, "I'm going to bring this on behalf of all the people who are similarly situated because we were all injured by the defendants when they used our works as training data."

The lawsuits include some other claims, but the training data claims in these cases are what I call the big kahuna. There are fifty-nine lawsuits so far in the United States. As Jennifer mentioned, GenAI systems are not only using text. They include images, recorded music, and video. All manner of things can be used as long as they are in digital form. And because the developers are using copyrighted works when training the models in GenAI systems, there are a lot of lawsuits. Getty Images has a lawsuit about its stock photography, and there are new lawsuits about news articles, movie characters, music lyrics, and recorded music.

What's the motivation behind these lawsuits? If you're a lawyer for a class-action lawsuit, then you see the potential for big money awards, as much as one-quarter of the take. Some of you may have heard about the recent $1.5 billion settlement in one of the *Anthropic* cases. The lawyers who were representing the plaintiffs in that case could get $375 million. That's a pretty big take. But it's also the case that establishing a new precedent for a cutting-edge field is enormously exciting and will attract more clients.

Many book authors, visual artists, songwriters, and even programmers object to the use of their works as training data without their permission, and without receiving any compensation or credit. Their stance is that the only reason why the GenAI systems are able to generate such high-quality outputs is because of the quality of the inputs that they used to build their models, and those inputs are the works created by authors, artists, and programmers. GenAI products are competing in the marketplace with human-authored works, and the human authors are losing income. The GenAI developers are huge corporations profiting from their use of these human-authored works.

Let's talk about copyright for a minute. The way that copyright works is that copyright protection attaches to all works of authorship that have been fixed in a tangible medium, and that includes everything from the Reddit post that you made to the photograph that you took and uploaded to Facebook. Copyright is not just for novels and movies. It's for everything that is an original work. And the rights vest in authors who can then sell or license those rights in whole or part to other people.

So what does copyright give you? It gives you the right to control reproductions of the work, the

distribution of copies, and the creation of derivative works, and those rights last for a long time: for the life of the author plus seventy years. Those rights are limited by a concept called fair use, which GenAI developers are relying on quite heavily.

Before I talk about fair use, let me give you a sense of the high-level principles of copyright because they have a bearing on how we should think about resolving these lawsuits. The constitutional purpose of copyright is to promote the progress of science – that is, knowledge – and the useful arts for the public good. Granting these exclusive rights to authors is an incentive for them to create and disseminate their works of authorship. But fair use is a limit on those exclusive rights because it provides breathing room for next-generation creations. Fair use has also become an important way for copyright to adapt in a time of rapid technological change. The Supreme Court recently said that fair use is a "context-based check that can help keep a copyright monopoly within its lawful bounds."[1]

So what is fair use? Every time you forward somebody's email or share something on a social media site, it's fair use. Fair use is basically a defense to charges of infringement, and courts consider four factors when deciding if a use is fair: 1) What was the purpose of the challenged use? Was it for criticism, comment, news reporting, teaching, or scholarship? Was it for a commercial or noncommercial purpose? 2) What is the nature of the copyrighted work? 3) What is the amount and the substantiality of the taking? 4) What kind of effect does the challenged use have on the market for the value of the work?

Let me give you an example of fair use before I talk about the GenAI cases. Google digitized millions of books from research library collections, and its purpose was to index the contents and then allow users to get snippets in response to their search queries. The Court of Appeals said that this use was highly transformative because Google's purpose in indexing the contents and providing snippets is a very different purpose from the authors'. And snippets provide public access to information, and that's a good thing. The nature of the work didn't cut one way or the other in this particular case because Google used all kinds of books. The court said that if you want to index the contents of books, then you have to copy the entire content. And so it was reasonable in light of the purpose. In terms of the market effects, according to the Court of Appeals, the authors do not have the rights to license the indexing of the contents of their works. And the snippets are too random and scattered to undermine the incentives for authors to write their books. Weighing all these factors together, the court concluded that Google made fair use of the books.

Of course, there can be different views about fair use. In the GenAI cases, from the authors' standpoint, the developers used their works for a commercial purpose. They copied the entire contents many times and used pirated books to train the models. This shows bad faith. The developers used the authors' creative expression to produce outputs that compete with the authors' works, causing them to lose sales and licensing revenues.

> "Fair use has become an important way for copyright to adapt in a time of rapid technological change.

According to the developers, they say that the purpose is highly transformative because the works are being used for such different purposes. The developers are only interested in the works as data and not for the expression of the work. They are interested in the words in relation to each other and how the sentences are constructed. They are not using the works to consume the expression that you would get if you were listening to or reading something. They claim that the amount that is being used is reasonable in light of the developers' purposes. The outputs don't infringe or supplant demand for the original works. And, finally, licensing markets are impossible.

There have been three decisions on these fair use cases so far. One is *Thomson Reuters v. Ross Intelligence*. Ross was making copies of Westlaw notes to train an AI model. The judge said the use was commercial and competes with Westlaw. Ross is appealing. A second decision is *Kadrey v. Meta*. This case was about whether it was fair use to use copyrighted books to train an AI model. The judge basically said, yes, it is fair use to use copyrighted books to train models. The results might have been

1. *Google LLC v. Oracle America, Inc.*, 593 U.S. 1, 22 (2021).

different, however, if the author was able to show that AI books will flood the markets and that, in turn, will harm the authors. And the third case is *Bartz v. Anthropic*. The judge in this case agreed with the judge in the *Kadrey* case that it's fair use to use books to train models, but when Anthropic's engineers downloaded 7 million pirated books, it was no longer fair use. There's a $1.5 billion settlement pending.

It will likely be five or maybe even ten years before the lawsuits in these fair use cases are resolved. That's a long time to wait to learn whether courts perceive GenAI technologies as beneficial to society or as predatory to copyright owners.

If we compare *Bartz* and *Kadrey*, we see that the judges agree on most of the issues: The developers' use of the copyrighted works had a highly transformative purpose, and they rejected the claim that authors are entitled to control licensing markets for the training data. But the judges disagreed on some issues. One is the significance of the uses of the data. The judge in the *Kadrey* case said that using the pirated books does not undermine a fair use defense. The judge in the *Bartz* case said that using the pirated books was definitely not fair use. The other issue on which the judges disagreed concerns the market dilution. The judge in the *Bartz* case, the one involving Anthropic, thought that the market dilution theory – that AI products are going to flood the market and nobody is ever going to buy human-authored stuff again – was science fiction. But the judge in the *Kadrey* case said that this is a big deal: The GenAI outputs are indirect substitutes for the authors' works so it doesn't matter that the outputs are not substantially similar. So we'll see what happens.

Now, if you are a nonprofit researcher, you may be wondering how all of this will impact you. And the answer is that for nonprofit research, especially for scientific and scholarship purposes, using copyrighted works as training for GenAI systems are favored uses, and they are less likely to harm the markets for those works. But we don't know how the judges will come out on these issues. They could issue a broad ruling against fair use or a broad ruling in favor of fair use, and that is going to have spillover effects for other entities besides the big tech companies. I have encouraged some nonprofit researchers to think about filing a brief to tell the judges that nonprofit research should be protected.

But what if you are using these pirated works? Are you an infringer? In the 1980s when the *Sony Betamax* case was before the U.S. Supreme Court, five million American households owned video tape recording machines. From Universal's standpoint, every person who used a video tape recording machine to make unauthorized copies of television programs was an infringer. Universal alleged that Sony was contributorily liable for infringement because it provided the tool that materially contributed to the infringement, and that Sony knew people were going to make copies without permission. As it turned out, the Supreme Court said that private noncommercial copies were fair use, and so Sony was off the hook.

Now if generative AI developers are infringers, does that mean that their users are also infringers if they use those GenAI technologies to generate outputs? There's a great deal at stake here. If you take your favorite Disney cartoon character and put them in a different setting, are you an infringer when you do that? Well, Disney thinks so. One of the things that the copyright law allows owners to do is to destroy things that are infringing on fair use. Some of the complaints have called for the destruction of models that have been trained with infringing material.

We really don't know what's going to happen. It will likely be five or maybe even ten years before the lawsuits in these fair use cases are resolved. That's a long time to wait to learn whether courts perceive GenAI technologies as beneficial to society or as predatory to copyright owners. Other countries, such as Japan, Singapore, and Israel, have laws that provide broad exemptions, giving AI developers a green light. So there is a risk that AI development in the United States could move offshore if the courts reject the fair use defenses. Thank you.

Abhishek Nagaraj

Abhishek Nagaraj is a Research Associate at the National Bureau of Economic Research, an Associate Professor in the Haas School of Business at the University of California, Berkeley, and Director of the Data Innovation and AI Lab.

The economics of copyright in the age of generative AI centers on outputs and inputs. Should the outputs of AI systems be copyrightable? On the input side, is the training of these models on copyrighted content without explicit licenses legal or fair use?

What I hope I can add to this discussion are some of the core economic issues and questions that will reshape our understanding of intellectual property in the digital age. Two years ago, I served on a panel of ten economists examining copyright issues related to AI. We realized very quickly that the economics of copyright in the age of generative AI centers on outputs and inputs. Should the outputs of AI systems be copyrightable? Think about a young developer or a young artist who uses an AI system to produce an original song or a movie. Should the developer or the artist own the copyright to that work? Is it creative or original? And on the input side, which has been the focus of a lot of our discussion today, is the training of these models on copyrighted content without explicit licenses legal or fair use?

What we learned is that the output question, although quite important, has a lot of precedent. Many of the economic questions here are not specific to generative AI and there are many other examples of people using technology to create new content. Every time we take a picture on an iPhone, the iPhone has its own algorithms that decide precisely how that picture should look. So even though you think the photo looks wonderful because of your input, the algorithms involved also can take some credit for that creative output. Frameworks exist to adjudicate sufficient human involvement, which is critical for this question. Copyright law has traditionally protected human-produced content. Copyright protection for AI-generated content has received less attention, and will require examination on a case-by-case basis.

What is particularly interesting from an economic point of view are the questions on the input side: whether the use of copyrighted material in training large language models constitutes fair use. As Pam mentioned, there are fifty-nine active lawsuits. So it is clear that generative AI and copyright are a topic of interest.

Before discussing the issues specific to fair use and copyright, let me first outline existing work on the economics of AI. One of the questions that economists are well qualified to answer relates to measuring the productivity impact of AI in real-world industries and settings. For example, there are some good case studies that show that when AI is used in call centers, writing, or coding, individual productivity can increase substantially. We also know that AI is designed to be a general purpose technology. The basic transformer architecture that Jen described can be modified with very little additional work to produce images or answer call center questions. The core technology is very flexible, and the productivity impacts can be extremely broad.

When AI is applied in specific domains, its effects can vary widely. The impact, in particular, depends on the skill level of the human using the system. As a result, outcomes can differ widely by context. In more routine work, such as call centers, AI can help new employees get up to speed much faster – sometimes matching or exceeding the performance of workers with ten years of experience. We see that the gap between the best and the rest can decrease dramatically when somebody is using AI. You might think that's a good thing. In scientific research or in domains in which there's much more creativity, what we see is that people who know how to use AI can get much better compared to others who don't know how to use the technology. In other words, the impact of AI by skill level depends on the nature of the task itself. In some cases, it can widen the gap between the experts and the novices, and in others it can close it.

One thing that's clear from all these studies is that this technology will have a transformational impact on the economy. The question that economists and computer scientists are interested in is to what extent will AI contribute to growth? One of the striking facts of economic growth is that whatever historical technology you consider, whether it's electricity, computing, or something else, U.S. growth for the past 150 years has been surprisingly stable at 2 percent per year, and none of these technologies have really changed that trajectory. Some economists will say that AI is transformative, but

they contend that it's a "normal technology" in the sense that it'll help us continue to grow along that trajectory. Computer scientists and AI proponents, on the other hand, argue that the old models don't really work to assess economic impact, and that with AI, we're going to see a 10 percent productivity growth. The answers to these debates will become clearer in the next decade, but at this point it's a debate on the magnitude of economic impact rather than its possibility.

What's missing in these debates are the economics of legal questions around fair use and fair compensation. To what extent does an AI system, training on data that weren't explicitly licensed, harm the market for that information? And when you break that question down, we find that there are two very different markets that we need to consider. The first is the market for the training data. The argument isn't really that if I produce an image of Mickey Mouse in a new context, that will reduce demand for the original movie. Rather, the concern is that Disney has an established and well-developed market for licensing its works. To the extent that such a market exists, or could exist, the claim is that AI companies harm it by using that content without paying for it.

The other market is what I call the "home market": the market for the original creative works. The argument goes that if people use an AI system to understand the plot of a J.K. Rowling book or movie, they may be less motivated to read or watch the original, which directly harms the underlying work. The type of media as well as the type of technology may influence these debates about the derivative works. And that is why I think we're going to see some variation across these cases, not just in terms of how the judges interpret the law, but around the economics of how these questions play out in a particular context and at a particular point in time.

In the market for training data, one of the real challenges is that transaction costs are important. The question is, to what extent is training data a commodity for these models, and to what extent can we establish both a price and/or transaction costs?

We know that there are millions of dispersed copyright holders, and there are no established mechanisms to negotiate with all of the parties. What the AI companies will tell us is that even if they wanted to pay the licensing fees for these works, they don't know how to figure out who the copyright owners are, and so determining fair compensation is tricky.

The other challenge concerns pricing. When you buy a book in the market, there's a specific price for that book. There's no reason to think that that's the price an AI model would be willing to pay, or if that's even the value of that book to a particular model. The models don't care how well a book "reads" to a human in the traditional sense. The real consideration for these models is how many high-quality tokens there are. The context in terms of quality is completely different.

"What the AI companies will tell us is that even if they wanted to pay the licensing fees for these works, they don't know how to figure out who the copyright owners are, and so determining fair compensation is tricky.

Beyond these questions, one must also consider the heterogeneous incentives of the creators and developers. I've talked with many academic authors who are creating content so that the AI systems can use that content for free. That's a very different incentive model from the one in which authors are looking to monetize their work, and their livelihood depends on it. Overall, these are thorny questions and there seems to be no consensus on valuation methodologies. So it's difficult to figure out the transaction costs.

On the other side of the "home market," what about the market impact of the end products, with the outputs competing with the inputs? There are two versions of this argument. One is the strict cannibalization version, in which the output acts as a substitute or a copy of the original work. To what extent are users using these models to get around paying for an underlying copy? To what extent do AI outputs reduce the demand for original works? In the Google books case, some of my work has shown that Google's distribution of these works actually *increased* demand for the physical work rather than substituted for it. The model might actually make us more interested in the underlying work.

There is a second argument for "dilution." Here the contention is that original products created with generative AI will compete with the content in the training data even if it does not exactly mimic or copy it closely. This is a relatively novel argument and the economic evidence for this is scant at the moment; the legal and economic frameworks have yet to be worked out as well.

The fair use rulings could fundamentally reshape the nature of competition for commercial and noncommercial models. One of the things the economics research has shown is that having a diversity of voices helps not only to get more open source and cheaper models, but it will actually get us to the next generation of this technology much sooner. Insofar as these fair use rulings will be broad, they will affect not only the decisions around how many providers or how many open source models we get, but the types of AI that we may have in the future. For example, in cancer treatment, intellectual property laws affect the ability to remix or combine different kinds of drugs that can have a meaningful effect on a person's lifespan. Intellectual property law determines to what extent follow-on companies can make specific combinations and remixes of the drugs. We can imagine some of those questions coming to fruition in the next generation of AI technology. There will also be geopolitical ramifications insofar as geographic variations in copyright law may create competitive advantages and disadvantages in different jurisdictions.

Thank you for your attention. While there are many questions in this area, I hope that, in the near future, some of the answers will become clear both from an economic as well as legal perspective.

Discussion

PAMELA SAMUELSON: We have some questions that our audience has submitted. The first question is for Abhishek. In cases like *Anthropic*, a $1.5 billion settlement might seem like a lot. But if the data are really good, then it's a high return on investment for Anthropic to settle if it drives model improvement. What's your take on that?

ABHISHEK NAGARAJ: It's very hard to comment on the specifics of that case because there's a lot that went on behind the scenes that we don't know much about. For instance, what are the different strategic considerations? Having said that, I think one of the things that I learned from you, Pam, is that copyright law is actually quite indifferent to infringement and how infringement should be paid for by companies. The value of a potential settlement is not how much these data helped me, but what are the liabilities and how much do I have to lose.

SAMUELSON: One of my hobby horses for much of my career is statutory damages in copyright law. Statutory damages are available for works that have been registered with the U.S. Copyright Office before infringement occurs. And those works include books, movies, sound recordings, and so on. The statutory damages start at $750 per infringed work and can go up to $150,000 per infringed work as the court deems just. When you multiply 750 by 1 billion, it's a big number. The incentive to settle these cases when you're facing liability in the billions or trillions of dollars is pretty high.

One way to look at the *Anthropic* settlement is it has a moat around itself because all of the big developers have used some pirated books, even if they haven't used seven million books. What, then, is the biggest weakness in the tech companies' arguments? If you talk about pirated data, there are judges who will say that it's bad to use pirated data. But from the standpoint of the engineers, they say that they found the data on the internet and they're using it only for statistical analysis. They say that that purpose is not affecting the market. Other judges will say that using seven million books is just too many. The judge in the *Kadrey* case basically said that the amount doesn't move the needle one way or the other. In the Google case, Google digitized the books with the purpose of making the index of the contents and the snippets available to the public.

NAGARAJ: I have a six-year-old child, and when she reads a book, what she is learning from the book is way beyond the literal content of that book. She's improving her vocabulary, she's learning about how sentence structure works, she's learning about other cultures. When a model reads a book, does it also have these multiple levels of learning? It seems to learn language, structure, and, of course, the exact content of the book. But the value of the output may be different, depending on the model. So I think it's important to understand the context in which the data affect the model's performance.

JENNIFER CHAYES: Our next questions are about China. Many people claim that China will win the AI field. Does copyright law in the United States compared to the laws in China help determine the

winner? Does U.S. law negatively impact U.S. competitiveness in AI?

China has less severe IP and copyright restrictions than the United States. The big tech companies here are investing a fortune in these models and paying their people very high salaries while keeping the models secret. These companies are expecting to make huge profits from the models.

China has a very different attitude. It is building open weight models so people can go in and modify the models. In the United States, we have open source software. Berkeley is the central player in open source software, and some of the most valuable companies that have spun out of Berkeley have released their open source software to the world. And then they put a proprietary layer on top of it, and that's how they make money. There's a real question of whether a more open ecosystem like they have in China or the one we have here, in which there are silos of different companies and a few, very highly paid people contributing to them, is the right way to go. These proprietary tools do not lead to more innovation. Given the copyright and IP elements as well as China's decision to build open weight models, I think China has a bigger chance to be the strongest contributor to generative AI.

SAMUELSON: Our next question concerns using AI systems as assistants or collaborators. Will these AI assistants or collaborators lessen the human skills needed to produce high-quality original works? Will the human creators earn less money? What are the economic consequences?

NAGARAJ: I've certainly heard arguments about the effects of using AI to train the next generation, independent of whether it's writing or music. One of our students is at UCSF, studying how the use of AI affects the training of the next generation of radiologists. The argument that I've heard some people make is that the use of these systems might harm the potential of the next generation to create new content. Having said that, there's a debate within economics on augmentation versus automation. Will the AI systems make all the boring work go away? A good counterexample is this: a lot of animation was computerized in the late 1980s and 1990s. And what that meant was someone didn't have to draw the same image by hand twenty times. They could move on to more creative tasks. I don't think any of us would say that the field of animation has become less creative because not as many people are learning to draw by hand. What is not so clear is whether the use of AI in the creative arts will harm the production of original and new creative works. And if that's true, then obviously those become potential inputs for the training data of the future.

> "There's a real question of whether a more open ecosystem like they have in China or the one we have here, in which there are silos of different companies and a few, very highly paid people contributing to them, is the right way to go.

CHAYES: Let me add to Abhishek's comments. We graduate about 2,200 students a year from our college of computing and data science, and we have the two largest majors on campus. At homecoming weekend, essentially every parent who comes up to me asks the same question: "Is my kid going to be okay?" It's a reasonable question. The genie is out of the bottle. We cannot prevent AI from being out there. Over the years, I've shifted my thinking. When I was a professor of mathematics in 1987, I wouldn't let people use a calculator in a second-year calculus class, and I remember the slide rule wars. But now I believe it's our responsibility to train our students to work in teams with AI collaborators. I think that's the world in which they will work and in which they will have their careers. We need to train our students in a way that prepares them for the very rapidly evolving world that they're entering.

SAMUELSON: Our next questions focus on the legal issues. When developers are training models with very large datasets, how does a copyright owner know, learn, or identify that their works were used to train a model?

This is a question that policymakers all over the world are trying to figure out. In the European Union and in the California legislature, there are some bills and laws about disclosure concerning

training datasets. Many of the large tech companies consider their datasets to be proprietary. One of the things that we need to understand is that when these companies do a big scrape, license some data, and then put it all into a big database, there is a stage in the training process in which the data are curated. That means removing duplicates, removing child porn, removing hate speech. This process gets rid of things that will not be good contributors to the model. And so there will be resistance from these big developers to provide work-by-work information. If you put your work on the internet, then it was probably used as training data.

Another interesting thing to note is that these companies need data. But the authors of these books, who are claiming that they have rights to license these works as training data, don't actually have the data themselves. The publishers have the data. And so the deals that you've seen talked about in the press are ones in which the data are from the publisher.

Our next question concerns Harvard University Press. Some authors or partners are licensing an AI company to use the press's material for a one-year trial as long as the citations to the material are guaranteed. Is that a good thing?

> The idea that hallucinations are going to go away any time soon is itself a hallucination.

I don't think we are there yet. Jennifer mentioned reinforcement learning, in which you ask an AI chatbot, "What about this?" And what you get back is actually a hallucination. So you retrain the model. "What you gave me just now was not the answer that I'm looking for." There's a way in which to fine-tune some of these models to make them more accurate. However, the idea that hallucinations are going to go away any time soon is itself a hallucination.

NAGARAJ: I think there's a sense that some people have that if we get direct citations then we have some direct measurement. The problem is there's no one-to-one association between the trainings and the outputs. When my six-year-old grows up and does really well on a particular exam, how much of that credit should be attributed to what she read when she was six? It's a ludicrous question to ask. In some ways, we're asking that question when we ask for citations for the AI-generated material. There are millions of different works. The value of each is in combination with the others. It may be really valuable on its own, but with others, perhaps it's not that valuable. Citations are helpful, but I think they are really a band-aid on the deeper philosophical issues that we need to talk about.

CHAYES: From a technical point of view, I agree with that. But if you take in the works in different orders, that is going to have a very different effect on quality.

SAMUELSON: Our next question asks if we can dream of the many ways in which AI can revolutionize the social good. Economic incentives allowed us to build products. What can we do to incentivize AI for social good?

CHAYES: There are grants for AI to tackle social good challenges. And that might lead NGOs rather than for-profit companies to do work in this area. I hope that the philanthropic community and the federal government will stand up and support this work, because the incentives are already there.

SAMUELSON: Universities and university researchers are working on things that advance the social good. I think the example that Jennifer gave of the Nobel Prize winner who is using AI to be more productive and faster shows that this is happening. It's a really good idea to give more attention to the use of AI for social good. In the health care area, there's an enormous amount of work going on. Jennifer mentioned the summit with the governor's office, which included AI experts, on the ways in which California could become more productive in managing traffic, water resources, environmental pollution, and the like. We are having these conversations in California with a governor who's open to the idea of making social good AI a meaningful thing.

That is all the time we have. I want to thank Jennifer and Abishek for their presentations and thoughtful comments, and I thank everyone who joined us today.

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To view or listen to the presentation, visit www.amacad.org/events/generative-ai.

Why Does Science Matter?

2142nd Stated Meeting | January 29, 2026 |
San Diego Natural History Museum

On January 29, 2026, the Academy's San Diego Committee, in partnership with the San Diego Natural History Museum, organized a discussion on the importance of science in our everyday lives and its impact on our future. The program featured **Rommie Amaro** (University of California, San Diego) and **J. Craig Venter** (J. Craig Venter Institute) in conversation with **Peter Cowhey** (University of California, San Diego). **Judy Gradwohl** (San Diego Natural History Museum) and **M. Margaret McKeown** (U.S. Court of Appeals for the Ninth Circuit) provided welcome remarks. An edited transcript of the program follows.

> In a time when information is everywhere but attention spans are scarce, the challenge is no longer just reaching people; it's cutting through the noise, building trust, and helping people understand why science matters in their lives.

Judy Gradwohl

Judy Gradwohl is President and CEO of the San Diego Natural History Museum (The Nat).

Good evening. We are delighted to welcome you to the San Diego Natural History Museum, The Nat. I am especially excited to co-host tonight's program with the American Academy of Arts and Sciences. Our organizations share a deep history. The Academy was founded 245 years ago; The Nat is now in its 152nd year, which makes us feel positively embryonic. Both The Nat and the American Academy were created with a bold purpose and a shared belief in the power of inquiry, learning, and public engagement. At our core, we're dedicated to bridging the gap between science and everyday life. In a time when information is everywhere but attention spans are scarce, the challenge is no longer just reaching people; it's cutting through the noise, building trust, and helping people understand why science matters in their lives.

Here at The Nat, basic science is at the heart of what we do. Our team of sixty-plus scientists conducts fieldwork across Southern and Baja California, documenting species, monitoring ecosystems, and tracking ecological change over time. They care for our collections of more than nine million specimens, which is an irreplaceable record of life in our region. These collections are the backbone of conservation, climate research, and biodiversity research. And this work is particularly meaningful here because we live in the most biologically diverse county in the continental United States – a richness made possible in part by the Kumeyaay people, the original stewards of the land. Our goal is to help shape a future in which plants, wildlife, and people thrive together, and where everyone feels connected to this extraordinary place. This is why programs like tonight's matter so much.

It is now my pleasure to introduce Judge Margaret McKeown. It's hard to know where to begin with someone of her distinction. She has served for more than twenty-five years as a judge on the U.S. Court of Appeals for the Ninth Circuit and is a member of the American Academy of Arts and Sciences. She is an affiliated scholar at the Bill Lane Center for the American West at Stanford University and serves as a jurist in residence at the University of San Diego School of Law. Judge McKeown served as a special assistant to the Secretary of the Interior as a White House fellow. Originally from Wyoming, she serves on the board of the Teton Science School and is the author of the award-winning book, *Citizen Justice: The Environmental Legacy of William O. Douglas—Public Advocate and Conservation Champion*. Please join me in welcoming Judge Margaret McKeown.

> Science touches everything — from the medicines we take to the ethical questions that we're confronting. And its centrality to our lives must not be taken for granted.

M. Margaret McKeown

M. Margaret McKeown is a Judge on the U.S. Court of Appeals for the Ninth Circuit. She was elected to the American Academy of Arts and Sciences in 2020 and is cochair of the Academy's San Diego Committee.

Thank you, Judy. I am delighted that The Nat and the American Academy of Arts and Sciences have collaborated on tonight's program. I want to give a huge thank you to Judy and her staff for allowing us to be in the museum after hours.

I'm proud to be part of the Academy's local committee in San Diego, which includes Dr. Tony Hunter, Dr. Susan Taylor, and Dr. Barbara Walter. We have 130 Academy members in San Diego. For those who may not be familiar with the Academy, let me give a very brief overview of the organization. The American Academy of Arts and Sciences is an honorary society and an independent research center, founded by John Adams, James Bowdoin, and other scholar patriots during the Revolutionary War. In their words, the purpose of the Academy is "to cultivate every art and science which may tend to advance the interest, honor, dignity, and happiness of a free and independent and virtuous people."

The Academy's members are quite diverse. They include Jane Goodall, Albert Einstein, Justice Scalia, Margaret Mead, Toni Morrison, Joan Baez, and Anderson Cooper. One member, in fact, has a connection to The Nat. Charles Darwin, elected to the Academy in 1874, has one of his specimens here at the museum. It's the Brown Lacewing. I didn't know what that was, so with ChatGPT's help, I learned that it's a tiny insect with tent-shaped wings. When Darwin was on one of his collection journeys to Tasmania in 1836, he collected this specimen, and it ended up here at The Nat, which is pretty fascinating.

Since those early days, the Academy has convened members, friends, and the public on important issues affecting our country and the world. Everything from eighteenth-century innovations on agriculture to fierce debates over evolution in the mid-1800s to nuclear weapons proliferation in World War II and, of course, now the health of our democracy in the twenty-first century. In every era, the Academy has been rooted in its ability to bring people together across different perspectives, different backgrounds, and different areas of expertise.

The question that we're posing tonight – why does science matter? – could not be more important to those of us here in the San Diego community or, in fact, in all other parts of our country. Science touches everything – from the medicines we take to the ethical questions that we're confronting. And its centrality to our lives must not be taken for granted. We hope that the panel discussion this evening will inform, inspire, and prompt you to ask questions.

Tonight's program is in the great tradition of the Academy's interdisciplinary conversations that are called Stated Meetings. They gave me a gavel to call our meeting to order. I have to tell you that in the courtroom, they don't let judges use a gavel. I don't know if they're afraid that we don't know how to use it or will misuse it. But here I am, calling to order the 2142nd Stated Meeting of the American Academy of Arts and Sciences.

I'm delighted now to turn things over to Peter Cowhey. Peter is Dean Emeritus and Qualcomm Chair Emeritus of the School of Global Policy and Strategy at the University of California, San Diego. He is also Vice Chair of the Board of Directors of The Nat.

Joining him in the conversation tonight are two esteemed scientists. Dr. Rommie Amaro is Professor and Endowed Chair in Chemistry and Biochemistry at UCSD. She leads the Amaro lab, which sits at the interface of chemistry, biology, physics, and pharmacology. Dr. J. Craig Venter is a Founder, Chairman, and CEO of the J. Craig Venter Institute. He is a biologist renowned for his contributions in genomics, including and most importantly the sequencing of the first draft human genome, and also the construction of the first synthetic bacterial cell. Dr. Venter is a member of the American Academy, elected in 2001.

We regret that philosopher Patricia Churchland is unable to join us this evening. Let me turn things over to Peter and the panel. Thank you.

Peter Cowhey

Peter Cowhey is Dean Emeritus and Qualcomm Chair Emeritus of the School of Global Policy and Strategy at the University of California, San Diego. He is also Vice Chair of the Board of Directors of The Nat.

Good evening. On behalf of my colleagues on the panel, I want to express our thanks to all of you for joining us. Tonight we're exploring why science matters, and we are going to do that through three rounds of questions. In the first round, Dr. Amaro and Dr. Venter will each choose a favorite example that shows why science matters and how it made that achievement possible. In the second round, they'll speculate about what they see as a major turning point for science in the future. And the third round will be a brief exchange about the challenges of doing science in today's contentious climate.

Rommie, let's start with you, and your favorite example that shows why science matters.

“A great example that shows why science matters is COVID-19. We didn’t really know how dangerous it was, how rapidly it would spread, or even very much about it. It was a situation in which we faced enormous uncertainty and very high stakes, and science gave us the best framework to address those threats.

Rommie Amaro

Rommie Amaro is Endowed Chair and Distinguished Professor in Theoretical and Computational Chemistry at the University of California, San Diego.

Thank you for including me in this conversation. I’m deeply humbled and honestly a bit stunned to be sitting beside Craig Venter, whose work inspired my journey in science. I was telling him earlier that when I was an undergraduate at the University of Illinois, the race to sequence the human genome was just coming across the finish line, and that amazing promise of science inspired me to devote my professional life to the study of science.

A great example that shows why science matters is COVID-19. We didn’t really know how dangerous it was, how rapidly it would spread, or even very much about it. It was a situation in which we faced enormous uncertainty and very high stakes, and science gave us the best framework to address those threats. We know that science doesn’t always get it right the first time. We have to continually update our models and hold ourselves accountable so that we can truly understand the full landscape of what we’re dealing with.

One of the things I remember most about the early days of the pandemic is that the global scientific community pivoted to study the virus. Scientists, clinicians, epidemiologists, and other researchers worked on their own little piece of the puzzle and then we all came together. As we know, one of the remarkable achievements was the development of the vaccines that saved so many lives, and still do.

In the process, we learned about viral biology and immune responses, and we did so at an unprecedented pace. The beauty of this global collaboration was that people left their egos at the door, and we were all rowing the boat in the same direction. But in terms of the scientific method and the scientific process, we saw the need to update our models much faster than we were accustomed to. We squished a decade of learning into eight months. I think this is a good example of why science matters.

COWHEY: Thank you, Rommie. Craig, you have a unique perspective on these matters.

J. Craig Venter

J. Craig Venter is founder, chairman, and chief executive officer of the J. Craig Venter Institute. He was elected to the American Academy of Arts and Sciences in 2001.

Thank you. Let's go back to when the Academy was founded. In the 1700s, there were roughly 600 to 900 million people on this planet. Over 90 percent of families had at least one child die before they turned five. Because of this child mortality, people had large families, and they often waited several years before naming their children. It's hard to imagine that today. So what changed?

There were improvements in sanitation: accessing clean water, getting rid of human sewage, and trying not to mix the two. Better sanitation led to a reduction in infant mortality and death overall. But it wasn't until the mid-1800s when things really started to change. The development of vaccines had the largest impact on infant mortality and human longevity, even more so than sanitation. The first vaccines reduced mortality by 60–70 percent. It surprised me that antibiotics didn't rank very high; they were considered relatively insignificant, though we know that antibiotics allowed a huge reduction in infant, birth, and surgical mortality.

In the 1850s, surgeons didn't wear gloves, and they went from patient to patient without washing their hands. If your dentist did that today, you would sue them. Or I hope you would if you lived long enough. That's the difference between antibiotics and vaccines. Antibiotics treat diseases; they don't cure them or eliminate them, whereas

The development of vaccines had the largest impact on infant mortality and human longevity, even more so than sanitation.

vaccines eliminate diseases. Let's look at the record with polio and smallpox. Polio has virtually been eliminated in the United States, with a few outbreaks in parts of the world. Smallpox has been eliminated as a disease. I was asked many years ago by the Secretary of Health to sequence the smallpox genome. The Russians were going to sequence a strain as well. And supposedly after we published the sequence, the remaining stocks were going to be destroyed to prevent the disease from reemerging.

I convinced the government not to destroy the stock because it would lead to a sense of false security. I knew that with the new synthetic methods that we were developing, we could reproduce smallpox. And so now we can remake any virus that causes disease in a matter of weeks.

COWHEY: Thank you, Craig. As I was listening to your account of the history, I was reminded that the recent Nobel Prize in Economics was awarded to several economists for their work examining

what led to sustained economic growth globally. If you think about the Roman Empire through about the mid-1500s, economic growth in most of the world was practically zero. And what happened in the mid-1500s was that the tinkering and learning through small-scale experiments became married to the growth of scientific societies and organized science and what we would think of today as medicine and engineering. This led to innovation and its dissemination in rapid ways. So, we not only reduced death, but we opened opportunities for growth along the way. And your story exactly fits that tale.

Let me ask you to think a little about what comes next. Rommie, your career is built at the intersection of different disciplines of science, and we've seen the discoveries that have come from that. So, what's next?

AMARO: I would say that predictions are next. In my lab group, we call ourselves *data integrators*. We develop highly detailed three-dimensional models of biological systems in which we take data from many different kinds of experiments and integrate them into one cohesive model. We then propagate their dynamics over time so we can see how the proteins move and interact with each other. It's a combination of all these different disciplines.

I'm perpetually excited by science, and I've always thought that it was a thrilling time to be a computational biologist because of Moore's Law, which has given us an amazing wind beneath our wings for decades. And now with machine learning and AI contributing to these efforts, one of the things I'm most excited about is the development of digital twins, where we're creating computer models or simulated models of biological systems that combine experiment, data, and theory (or simulation) with AI machine learning. This is helping us to understand how things work at the cellular scale. I think in the next five years, this research is going to be very impactful for health in general.

COWHEY: If you had to make a wild guess, and you're not being held accountable for being correct, do you think it would overturn some notion that we have about biological systems?

AMARO: I think that's possible for airborne disease transmission and measles. We need to understand how science works and we need to continually revise our models. I think learning how changes in the earth's climate can contribute to new outbreaks will allow us to do better at forecasting, predicting, and responding.

COWHEY: Thank you. Craig?

VENTER: I have two answers. I'll start with measles, because the answers depend on what we do as a society and whether we're going to go in a more negative or positive direction. It takes very few people to change the direction of how things might happen. Measles is the most contagious viral disease that we know of. One child can contaminate everybody in a room who is susceptible, and historically measles has been one of the biggest killers because it spreads so rapidly. But that changed overnight with the measles vaccine. We went from an era when parents had large families because they expected some of their children to die before they turned five years old to smaller families because parents could trust that their children would survive.

The measles vaccine is an unusual situation because it's based on herd immunity, which means a certain percentage of the population has to be immune to keep the disease in check. And that turns out to be a very high number, 95 percent of the population, which has to be maintained year after year. If the rates drop even a little, we start to see major outbreaks. For example, if only 85 percent of the population in this country is vaccinated, we will see an increase in infant mortality and families having to deal with losing their children again.

People mistakenly think that vaccination is an individual decision, but it isn't for two key reasons. One, which I mentioned already, is herd immunity. Another reason is that measles has a unique effect: it can erase your immune system's memory for weeks, months, or even years. So a child that survives measles is highly susceptible to all other infections for a period of time. If we lose our herd immunity, it's not just measles that could return. It could become a watershed moment when other major infectious diseases return, potentially taking us back to the 1700s. That's why COVID is such a powerful example of how quickly new vaccines can be developed to combat a new disease.

Let me turn to something more positive, and that's the impact of genomics. Genomics is the discipline that's already had and will continue to have a greater impact on humanity than any other scientific breakthrough. First, we learned how to read and assemble the genetic code. We can now take that digital code and convert it back into chemistry, and even into living systems. Using these techniques, we've developed the first synthetic flu vaccine. Influenza vaccines are still produced using relatively slow and primitive methods. Because it takes a long time to manufacture the vaccines, the

decisions made by the World Health Organization about which strains to select have to happen far in advance. By the time the vaccine is available, the circulating strains may have changed, which is why the match is sometimes imperfect. With synthetic methods, we envision a very different model: one in which vaccines are generated digitally and produced rapidly, potentially with a small device attached to a desktop computer that could instantly print out a new vaccine based on the latest strains that are circulating. I think synthetic genomics has the potential to pave the way for a new industrial revolution, changing how we manufacture things, and even how we change our own species, hopefully for the better.

COWHEY: That's an ambitious hope in today's world. The scientific enterprise in the United States has been leading scientific advancement in the world since roughly World War II. We were not alone in producing those advancements. But I think it's fair to say that we were at the epicenter of advancement.

VENTER: Emphasis on *were*.

COWHEY: Let me ask you about the various challenges that you face as working scientists, and how you're coping with them. Rommie, let me start with you and ask about the people equation. A large part of our scientific community, in labs, universities, and organizations like the J. Craig Venter Institute, is made up of foreign-born PhDs, and their presence today is under scrutiny. At the same time, there aren't enough young people who are studying science. You have an outstanding record of mentoring young scientists and helping them succeed. Rommie doesn't often highlight this, but if you look at the teenagers winning major science awards in the United States, she has often been their mentor. How are you approaching these challenges around people and talent today?

AMARO: I'll admit that it's tough. There are about twenty in my group, and over half are foreign born. The diversity of thought and perspective that they bring as well as their skills have contributed mightily to the scientific gains in my group and, by extension, across the United States.

At the same time, I need to admit that in the current political climate, it feels as if every week there's another challenge, which leads to more instability. There's a strong dynamic in our group, with everyone supporting each other. And the university is supporting them too. I think larger organizations in San Diego are also doing what they can to support our international scientists. But it is quite worrisome. Part of being an academic scientist is training others, not only in the lab but also in the classroom. And that's really a privilege of the professorate that we get to do that. But I don't have the magic answer for this challenge. It's tough right now.

VENTER: I think our only hope is if people vote their conscience. I was trained that science was an international community, and in the 1970s when I was at UCSD it was. At the time, the Soviet Union was considered our arch-enemy, yet we still had science exchanges. My mentor, Nathan Kaplan, brought several Russian scientists to work with us, including some very high-level researchers. Many of them arrived with government minders. Despite the political tensions, scientific and intellectual exchange continued.

Science exchange, and particularly intellectual exchange, with China, even just five years ago, was very different from what it is today. And that shift is concerning. In synthetic biology, for example, China is now outspending the United States by roughly fifteen to one. Their latest budget is over $15 billion, while ours is under $1 billion. And this is considered the most active area for the economy and for the future of science.

It wouldn't be such a problem if science remained open, with free exchange and collaboration. But those interactions are now being restricted to a large extent, making things much more difficult. Science has always had strategic uses. The forefront of science has often been used to develop new weapons. What's different now is that science itself is being weaponized because of its economic and health impacts. Human genome sequencing is a good example. In China, genomic sequences generated in the country cannot be shared abroad, but China has made a huge effort to collect genomic data from populations around the world. China is also the only country that I'm aware of that uses genomic sequences in ways that raise serious concerns, such as monitoring and tracking their minority populations.

As we become more isolated, things become more challenging. Science has long depended on

the open exchange of ideas and, most importantly, people. My hope is that things will turn around, because once these infrastructures are weakened or dismantled, they can't simply be restarted by flipping a switch. And we are already seeing a shift: U.S. universities are no longer the first choice for many international students because of the political climate in this country. They are choosing to train elsewhere, and that often means that they will build their careers elsewhere too. Our hospitals are feeling the effects, particularly from the lack of interns and residents. In many rural hospitals, interns and residents make up the majority of the health care workforce, which has a direct impact on patient care.

Though it may not sound like it, I'm generally an optimistic person. Our country has come to these impasses before in the past multiple times, and people always rise up. I think that's all we can hope for at this stage.

AMARO: It is true how quickly you can destroy something that took so long to build. And rebuilding is a slow process.

VENTER: If you follow the news, you'll see that measles is making a significant comeback in some areas. In other countries, the situation is even worse. In the United States, measles cases had dropped to nearly zero, but now there are outbreaks in about twenty states. Some of these outbreaks are concentrated in specific communities or cities where vaccination rates have dropped. As I mentioned before, if the vaccination rates drop to 85 percent, it will be very difficult to come back from that. People need to be aware of this risk. Our government is anti-vaccine and is particularly opposed to measles vaccines for children, so we have to hope those attitudes change quickly.

COWHEY: And you say you're generally an optimist! Let me ask one last question before we turn to audience questions. The research funding story that you described, Craig, isn't actually new. For some time now, U.S. government spending on science has been stagnant or in some cases has been declining. The salvation for certain fields has been business investment in research and development. In the United States, private-sector R&D spending is far larger than what the government is spending. That represents an epic turnaround from the period after 1945, when the federal government led investment in scientific research. Today, the balance has flipped, with business spending more than the government, even in areas of the most basic research.

The challenge is that businesses, understandably, set their priorities based on their commercial interests. This leads to heavy investment in areas like AI, while other fields that are not closely tied to the business mission receive less investment, or benefit only from a small amount of spillover. Craig, you've spent much of your career at the intersection of commercial and fundamental biology. What is your perspective on this dynamic, and what do you think it means for the future?

VENTER: I have started businesses as a way to fund research at my not-for-profit institute when the government would not provide funding. The government was so concerned about creating a synthetic cell that they were afraid to fund that research. So, I founded a company to finance the project in exchange for the IP. We also worked on the human genome, sequencing it in nine months instead of fifteen years, and for roughly $100 million instead of $5 billion. But who's keeping score?

One thing that remains unique to this country is that we have both venture investment and philanthropic giving. In Europe and in Australia, there is very little venture funding, and philanthropic giving is also limited. In the United States, many people who have significant wealth feel a responsibility to give back, though there's certainly room for improvement. Investment and philanthropy together help offset what government cannot or will not fund. Interestingly, most NIH funding has historically come during Republican administrations, not Democratic ones. It looks like Congress is trying to continue that trend, but we'll have to wait and see.

COWHEY: I would add that in some of the work that we've done at UCSD, we've discovered that for university and independent laboratories like Salk, philanthropy is funding roughly the equivalent of 40 percent of the U.S. government budget for basic research. And that has been one of our saving graces. Let's now turn to questions from our audience.

AUDIENCE MEMBER: Was the real turning point in public perception of vaccines driven more by the polio vaccine than the measles vaccine since polio had a much higher morbidity rate and a much more devastating impact on families?

VENTER: I'm old enough to remember standing in line to get the polio vaccine, which was given

to us on sugar cubes. Before the vaccine, everyone knew someone who had polio or had died from it. I had a classmate who used a wheelchair because of it. It may feel more dramatic because it happened so suddenly; there was a clear "before" and "after" within our lifetime. Yet measles has actually killed far more people than polio. But it doesn't have to be a competition.

AMARO: We are getting a lot of conflicting information right now about vaccines. Officials in the Department of Health and Human Services don't agree with scientists and doctors about the importance of vaccines so the public is understandably confused, and we're seeing vaccination rates drop below 95 percent.

VENTER: Part of the issue is acknowledging that vaccines can have side effects in some people. Adjuvants can cause reactions in certain individuals, and the Vaccinia vaccine caused major side effects that affected a large number of people. After we sequenced smallpox, we were asked to sequence the Vaccinia vaccine. We discovered that Vaccinia is actually a mix of at least five different viral isolates, rather than a single isolate. As a result, a new smallpox vaccine was developed using one of the isolates that did not cause major side effects, and that version is now kept as the standby emergency vaccine.

When most people are healthy and their children are no longer dying from disease, the side effects from vaccines that affect a very small percentage of people become much more visible. In the past, both the government and the pharmaceutical industry did a poor job of acknowledging that, largely because the overall benefit to society was good. But every vaccine, just like every medicine, can cause side effects in certain populations. I'm hopeful that as we learn and understand more about genomics, we'll be able to predict these reactions and side effects more accurately.

AUDIENCE MEMBER: I think we all appreciate that science matters. But the essential question, which Dr. Amaro was getting at, is why trust science? There's a recent article by Russ Douthat in the *New York Times* that featured an interview with Jay Bhattacharya, the head of the National Institutes of Health, and you can see that inherent distrust of science clearly. Bhattacharya developed many of his views during the COVID-19 pandemic, when he believed the response from scientists and public health officials was fundamentally misguided and that they were not telling the truth about two things. First, how infectious the virus was and its mortality rate. And second, how effective the lockdowns would be. So the question is, how do we communicate science more effectively and in a way that people who don't have a science degree can understand and trust the science?

VENTER: I think the distrust of science goes back even further. A lot of people didn't know that the NIH was funding gain-of-function research in Wuhan. Applying Occam's razor, the hypothesis most worth scrutinizing is that COVID-19 originated in a Wuhan laboratory, not as a deliberately engineered super-contagious pathogen but as a result of gain-of-function research that may have accidentally infected researchers. How it might have spread from there, whether they went to the market or it came from some other route, isn't known, in part because some people involved in the U.S. government aren't talking about it, and the Chinese government has not allowed access to investigate.

So COVID began as a mystery. And no one had definitive answers at the start. Experts were making their best educated guesses. And those guesses were treated as facts because policies had to be made. Tony Fauci is a friend and brilliant scientist. He and others were relying on the best knowledge that we had from previous pandemics. They were using the kinds of strategies you see in movies like *Contagion*: trying to control a major pandemic but not knowing how to do that. In hindsight, those early guesses weren't really that far off. The pandemic was under control faster than I expected. But those early decisions were based on informed guesses. It's hard to ask people to follow public health guidance when you're telling them you're still figuring things out.

AMARO: This is why I think it's important to talk about science as a method and as an ongoing process. We're constantly updating our models as new data comes in. So, it shouldn't be surprising if the guidance changes six months later when a new variant appears. We haven't done a great job of making that clear. And this applies to masking too. As somebody who understands droplet transmission, that whole debate was frustrating. I understand that

policymakers need to project confidence so people will trust their guidance. But in the end, we are suffering from our own inability to educate people about how science actually works.

VENTER: Different countries took different approaches. Sweden tried to achieve herd immunity by allowing widespread infection, and that didn't turn out so well. So, while some of the methods may have felt heavy-handed, wearing masks was one of the smartest steps. But it is hard for people to understand the scientific process. It was always taught dogmatically as if everything was an absolute. My good friend and colleague for twenty years, Ham Smith, a Nobel laureate who died last year, and I actually believed something that most scientists believed at the time. When we set out to build the first synthetic cell, we assumed that biology was fundamentally understood. We thought we could go through the scientific literature, identify all the components required for life, assemble them into a genome, boot it up, and we would produce a living cell. It didn't work. Our designs failed. The biggest surprise was what we learned through trial and error: roughly a quarter of the genes essential for life are of unknown function. When we look at the human genome, over half the genes are of unknown function. And from all the sequencing my team has done in the oceans and elsewhere, we have approximately a 100:1 ratio of genes of unknown functions compared to the ones we do understand. When we started, if you asked most scientists, they would have said that the rules of biology were already known, and that we understood how everything works. My most quoted line is, "We don't know shit about biology."

COWHEY: Wasn't there a rock and roll song about that? Our next question.

AUDIENCE MEMBER: I'm a scientist, so friends and family often come to me when they want answers about something. I find myself explaining the nuance of science: that we do know a lot, but our understanding is always evolving. Every time new evidence emerges, our knowledge gets updated. I sometimes wonder whether, at least with vaccines, we've almost become too successful. Because vaccines work so well, people have forgotten how severe these diseases were before we had them. When you no longer see people dying from those illnesses, it becomes easier to forget how important the vaccines really are. There's a saying that life is a progressive narrowing of choices. How do you make sure that the choices you make along the way, scientific and ethical, are good ones?

VENTER: This is an important question because there's a whole discipline called bioethics and many people expected bioethicists to act like "the priests of science," telling people what was ethical and what was not. My view is just the opposite: every scientist has to have their own ethical framework that guides their work. When we set out to make the first synthetic lifeform, we didn't just start and say, "Let's go for it." We spent a year and a half conducting a review with the community, and that review was led by bioethicists. Then in 2010 we announced the first synthetic cell, and President Obama announced a new bioethics committee to review the creation of synthetic life. I think it was the first time in modern science when an announcement got responses from the President and the Pope on the same day.

President Obama applauded our attempt at making synthetic life. The Pope said, "Dr. Venter did not create life, he just changed one of its motors." But we welcomed his comments because it calmed people down. We all have our own ethical standards that develop throughout our lifetime, and I apply my standards every day in the work that I do.

AMARO: I think that at least in science, depending on the specific domain, there's generally more acknowledgment of ethical concerns and a greater appreciation for the complexity of these situations. Often, there isn't a single "right" answer or a clear line to draw, which is just one of the many challenges that scientists navigate every day.

COWHEY: Thank you, Rommie and Craig, for this interesting conversation. Let me now turn things over to Judge McKeown to close our program.

MCKEOWN: Please join me in thanking this amazing panel. We are fortunate to have resources like Craig and Rommie in our San Diego community. We've talked about all the challenges we have today: politics, policy, funding, basic research, and ethics. I'll leave you with one thought, and that is, channel your inner genetic optimism.

To view or listen to the presentation, visit www.amacad.org/events/why-does-science-matter.

NOTEWORTHY

Select Prizes and Awards to Members

José Andrés (World Central Kitchen) received the Yale Legend in Leadership Award from the Yale Chief Executive Leadership Institute at the Yale School of Management.

Brenda Bass (University of Utah School of Medicine) received the 2026 RNA Society's Lifetime Achievement in Science Award.

Sian Leah Beilock (Dartmouth College) received a 2026 Illustrious Alumni Award from the University of California San Diego.

Nicholas Burns (Harvard University) was awarded the Dayton Peace Prize.

Nancy E. Davidson (Fred Hutchinson Cancer Center) is the 2026 recipient of the David Karnofsky Science of Oncology Award from the American Society of Clinical Oncology.

John Donoghue (Brown University) was named a 2026 Laureate of the Queen Elizabeth Prize for Engineering.

Cynthia Dwork (Harvard University) was awarded the 2026 Japan Prize.

Elena Fuentes-Afflick (Association of American Medical Colleges) is the 2026 recipient of the Elizabeth Blackwell Women in Medicine Career Achievement Award, given by the American Medical Women's Association.

Alan M. Garber (Harvard University) received the Yale Legend in Leadership Award from the Yale Chief Executive Leadership Institute at the Yale School of Management.

David Ginty (Harvard Medical School) was awarded the 2026 Brain Prize by the Lundbeck Foundation. Dr. Ginty shares the award with Patrik Ernfors (Karolinska Institutet).

Carla Hayden (Mellon Foundation) received the Biographers International Organization's 2026 Biblio Award.

Clark Spencer Larsen (Ohio State University) received the 2026 Lifetime Achievement Award from the American Association of Biological Anthropologists.

H. Blaine Lawson, Jr. (Stony Brook University) was awarded the American Mathematical Society's 2026 Leroy P. Stelle Prize for Lifetime Achievement.

Karolin Luger (University of Colorado, Boulder) was awarded the 2026 Vilcek Prize in Biomedical Science, given by the Vilcek Foundation.

Teresa Meng (Stanford University) was inducted into the National Inventors Hall of Fame.

Lynn Nottage (Columbia University) is the recipient of the 2025–2026 Lenfest Distinguished Faculty Award, given by the Executive Committee of Arts and Sciences of Columbia University.

Alina Payne (Harvard University) was named a Fellow of the Society of Architectural Historians.

James Ryan (University of Virginia) received the Yale Legend in Leadership Award from the Yale Chief Executive Leadership Institute at the Yale School of Management.

Amy Tan (San Francisco, CA) received the Robert Kirsch Award for Lifetime Achievement from the *Los Angeles Times* as part of its 46th annual Book Prizes.

Natasha Trethewey (Northwestern University) is the 2026 recipient of Oregon State University's Stone Award for Literary Achievement.

Kevin Young (*The New Yorker*; New York University) was awarded the 2026 Thomas Robinson Prize for Southern Literature, given by Mercer University's Spencer B. King Jr. Center for Southern Studies.

Feng Zhang (Massachusetts Institute of Technology) was inducted into the National Inventors Hall of Fame.

New Appointments

Manjul Bhargava (Princeton University) was named President of the National Museum of Mathematics.

Naomi Halas (Rice University) was elected to the Council of the National Academy of Sciences.

Suzanne Nora Johnson (Markle Foundation; University of Southern California) joined the Board of Directors of Wellcome Leap.

Sandra Knapp (Natural History Museum, London) was appointed Director of Research of the Museum.

Gary Koretzky (Weill Cornell Medicine) was appointed Vice Provost for Research for Cornell University's Ithaca, Cornell Tech, and AgriTech campuses.

Tod Machover (Massachusetts Institute of Technology) was appointed Faculty Director of the Media Lab at MIT.

M. Elizabeth Magill (University of Pennsylvania) was named Dean of the Georgetown University Law Center.

Jennifer Mnookin (University of Wisconsin–Madison) was appointed President of Columbia University.

Diane C. Mutz (University of Pennsylvania) was elected to the Council of the National Academy of Sciences.

Daniel R. Porterfield (Aspen Institute) was named Chief Executive Officer of the Jack Kent Cooke Foundation.

Anna Marie Prentiss (University of Montana) was elected President-Elect of the Society for American Archaeology.

Franklin D. Raines (Washington, D.C.) was elected Chairman of the Board of Regents of the Smithsonian Institution.

Guillermo Sapiro (Princeton University) was appointed a Lingnan Fellow of the Lingnan University Institute for Advanced Study.

Ben Vinson III (Howard University; American Historical Association) was appointed a Fellow at the Afro-Latin American Research Institute of the Hutchins Center for African & African American Research at Harvard University.

Select Publications

POETRY

Jonathan Galassi (New York, NY). *The Vineyard: A Poem*. Knopf, March 2026

Jorie Graham (Harvard University). *Killing Spree*. Farrar, Straus and Giroux, May 2026

FICTION

Colm Tóibín (Columbia University). *The News from Dublin: Stories*. Scribner, March 2026

NONFICTION

Omer Bartov (Brown University). *Israel: What Went Wrong?* Farrar, Straus and Giroux, April 2026

John Y. Campbell (Harvard University) and **Kaye Husbands Fealing**, eds. (Georgia Institute of Technology). *Financing Institutions of Higher Education*. University of Chicago Press, February 2026

Kimberlé Williams Crenshaw (Columbia Law School; UCLA School of Law). *Backtalker: An American Memoir*. Simon & Schuster, May 2026

Donald L. Horowitz (Duke University). *The Promise and Perils of Devolution: Federalism, Regional Autonomy, and Ethnic Conflict*. Oxford University Press, February 2026

Pieter M. Judson (European University Institute) and **Tara Zahra** (University of Chicago). *The Great War and the Transformation of Habsburg Central Europe*. Oxford University Press, December 2025

Andrew H. Knoll (Harvard University). *Earth and Life: A Four Billion Year Conversation*. Princeton University Press, March 2026

Charles Larmore (Brown University). *La réalité du bien*. Editions Hermann, February 2026

Nicholas Lemann (Columbia Journalism School). *Returning: A Search for Home Across Three Centuries*. Liveright, March 2026

Ruthie Rogers (The River Cafe). *Table 4 at The River Cafe: Conversations about Food and Life*. Gallery Books, March 2026

Neil deGrasse Tyson (Hayden Planetarium, American Museum of Natural History). *Take Me to Your Leader: Perspectives on Your First Alien Encounter*. Simon Six, May 2026

We invite all Fellows and International Honorary Members to send notices about their recent and forthcoming publications, new appointments, exhibitions and performances, films and documentaries, and honors and prizes to bulletin@amacad.org.

Organist **E. Power Biggs** (right) demonstrates the armonica for **Maynard L. Harris** and Academy President **John E. Burchard**.

Benjamin Franklin's Glass Armonica in Concert

By **Michele Lavoie**, *Director of Archives*

The year 2026 marks both the 250th anniversary of the founding of the United States and the 320th anniversary of the birth of Benjamin Franklin, founder of the American Philosophical Society in Philadelphia and a member of the Academy's first elected class of members in 1781.

In January 1956, to commemorate the 250th anniversary of Franklin's birth, the Academy organized a three-part lecture series exploring different aspects of his life and achievements, culminating in a birthday dinner. One of the after-dinner speeches focused on "Franklin and Music," which led to another celebratory event a few months later.

This fourth event, held in conjunction with the Academy's Stated Meeting on April 11, 1956, was a concert honoring both the 250th anniversary of Franklin's birth and the 200th anniversary of Mozart's birth. Organist and Academy member E. Power Biggs (elected 1950) led the program. Several musicians affiliated with the Boston Symphony Orchestra joined him, including Academy members violinist Richard Burgin (elected 1947) and tenor Roland Hayes (elected 1953). Biggs's remarks were later published in *Dædalus*.[1] The concert was held in the Kresge Auditorium at MIT and featured a unique performance of Mozart's adagio for the glass armonica, along with other musical works by Mozart and Franklin.

For the occasion, the Academy commissioned a re-creation of Franklin's own design for the glass armonica, as detailed in his *Letter to Beccaria* (Milan, 1776). Corning Glass Works constructed the instrument in collaboration with renowned organ builder Herman Schlicker. However, design flaws made the instrument unsuitable for performance – the glass bowls cracked from the hammer pressure specified in Biggs's original design – so a much simplified version had to be constructed for the concert. The instrument still exists today and is part of the Academy's archival collections.

1. E. Power Biggs, "Benjamin Franklin and the Armonica," *Dædalus* 86 (3) (May 1957): 231–241, https://www.jstor.org/stable/20026409.

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ONLINE

If you follow the Academy on LinkedIn, you may have seen our recent post about Michael Mandelbaum's 1982 *Dædalus* essay, "**Vietnam: The Television War**." His essay offers an early and enduring analysis of how the shift from print to video culture altered public perception of the conflict.

Today, *Dædalus* is an open-access publication, though that wasn't always the case. Essays from past issues are now available online, ready to be rediscovered and shared. Visit **www.amacad.org/daedalus** to access the current issue and past volumes of the journal.

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