Written Testimony of Samuel Hammond
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"The State of U.S. Science and Technology: Ensuring U.S. Global Leadership"

Chairman Babin, Ranking Member Lofgren and members of the committee, I thank you for the opportunity to testify today.

My name is Samuel Hammond, chief economist for the Foundation for American Innovation. FAI is a group of technologists and policy experts focused on developing technology, talent and ideas to support a freer and more abundant future.[1]

I am here to emphasize that robust federal science funding is indispensable for maintaining U.S. competitiveness—especially in the face of intense technological competition with China. From the Cold War on, leadership in basic science and technology has been a cornerstone of American economic and national security; not just in the military realm, but as the foundation for unbounded private sector innovation and dynamism.

Scientific productivity has declined

It is therefore disturbing to see growing indications that federal science funding has lost its bang for its buck.[2] Some dismiss this as the natural course of things; that we picked all the low-hanging fruit in the 20th century and should expect diminishing returns. Others, myself included, worry that this is just a convenient way to excuse the evidence that something is deeply broken with America's premier research institutions.[3]

While it is true that federal spending on science and R&D is at a low point as a percent of GDP, in absolute and inflation adjusted terms it has never been higher – ten times higher

[1] See: www.thefai.org.
[2] Tyler Cowen and Ben Southwood, "Is the Rate of Scientific Progress Slowing Down?" GMU Working Paper in Economics No. 21-13, April 9, 2021. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3822691.
[3] Metascience 101 - EP2: "Is Science Slowing Down?"
https://www.macroscience.org/p/macroscience-101-ep2-is-science-slowing.

than in my parents' generation.[4] And yet the last 40 years has been a period of relative stagnation, both in terms of scientific productivity and in the productivity of the broader economy.[5] We have more scientists than ever; more publications than ever; and many more research institutes and funding lines than ever, and yet less and less to show for it. As a 2023 article in Nature found,

> "Recent decades have witnessed exponential growth in the volume of new scientific and technological knowledge, thereby creating conditions that should be ripe for major advances. Yet contrary to this view, studies suggest that progress is slowing in several major fields. … papers and patents are increasingly less likely to break with the past in ways that push science and technology in new directions. This pattern holds universally across fields and is robust across multiple different citation- and text-based metrics."[6]

It is hard to pinpoint any one factor behind the slowdown in scientific productivity, which suggests the cause is multifactorial. Consider that, in 1980, the National Institutes of Health (NIH) funded twice as many researchers under 40 as those over 50, but today funds five times as many grants to those over the age of 50.[7] This traces back to the 1994 ban on mandatory retirement ages for academic faculty. In turn, the typical American scientist no longer gets to direct their own major project until they're gray in the hair, despite substantial evidence that scientific creativity peaks early in one's career.[8]

Science has bureaucratized

Then there is the broader bureaucratization of American science and academia, as seen in the fact that principal investigators now spend over 40 percent of their time on administrative compliance.[9] Combined with a peer review system that punishes heterodoxy,[10] compliance burdens have led awards to concentrate at institutions with the

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[4] Kelsey Piper, "Why is science slowing down?" Vox, January 11, 2023. https://www.vox.com/future-perfect/2023/1/11/23549993/science-research-progress-studies-disruption-technology-artificial-intelligence-biotechnology.

[5] Samuel Hammond, "Stagnation is real," Fusion, September 24, 2024. https://www.fusionaier.org/post/labor-markets-in-the-rear-view-mirror.

[6] Michael Park, Erin Leahey and Russell J. Funk, "Papers and patents are becoming less disruptive over time," Nature, January 3, 2023. https://www.nature.com/articles/s41586-022-05543-x.

[7] Daniel Bier, "Science Funding Is Wasting Young Careers, Here's How to Fix It," Freethink, March 12, 2019.

[8] Benjamin Jones et al., "Age and Scientific Genius," National Bureau of Economic Research Working Paper No. 19866, January 2014.

[9] Reducing Bureaucracy, Good Science Project. https://goodscienceproject.org/reducing-bureaucracy/

[10] Tim Hwang, "Antitrust in the Marketplace of Ideas," Macroscience, June 28, 2023. https://www.macroscience.org/p/antitrust-in-the-marketplace-of-ideas.

best grant offices – not necessarily the best research ideas. Consider that just 2 percent of NIH-supported institutions receive 53 percent of all research project grants.[11] These risk-averse, insider-friendly dynamics are likely core to why Katalin Karikó's early work on mRNA vaccines was ignored for so long;[12] why the NIH funded two decades of research into a fraudulent theory of Alzheimer's Disease;[13] why debate into the origins of Covid-19 was suppressed; and why so much seemingly settled science failed to replicate.[14]

To make matters worse, in recent years NSF and NIH have seen an infusion of diversity, equity, and inclusion (DEI) mandates into scientific grantmaking. In 2020, less than 1% of NSF funding went to DEI-related projects, growing to over 27% in 2024.[15] While equal opportunity is a worthy goal, the rush to embed DEI criteria into every corner of federal science funding has resulted in politicized research, demoralized faculty, and billions in wasted taxpayer dollars.[16] President Trump's recent actions aimed at expelling DEI from federal grants, and from universities that benefit from federal funding, are thus an important step towards restoring merit and rigor to the research enterprise – though it is only the start.

With this as context, it is no wonder that many of today's most transformative scientific breakthroughs now occur within privately funded, nonprofit research organizations. For example, in 2024, just three years after its founding, the Arc Institute in Palo Alto, California, announced the discovery of a revolutionary new technique for programmable RNA and precision gene editing.[17] Upstream of the discovery is Arc's model of giving scientists no-strings-attached, multi-year funding, so that they aren't required to apply for external grants. This suggests there may be large returns to reallocating federal science dollars out of academia and into similar such "focused research organizations."[18]

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[11] Wayne Wahls, "Opinion: The National Institutes of Health needs to better balance funding distributions among US institutions," PNAS, Vol. 116, Issue 27, pp. 13150-13154, July 2, 2019.
[12] Stuart Buck, "The Karikó problem: Lessons for funding basic research," STAT News, February 1, 2022. https://www.statnews.com/2022/02/01/kariko-problem-lessons-funding-basic-research/.
[13] Charles Piller, "The Devastating Legacy of Lies in Alzheimer's Science," New York Times, January 24, 2025. https://www.nytimes.com/2025/01/24/opinion/alzheimers-fraud-cure.html.
[14] See: https://en.wikipedia.org/wiki/Replication_crisis
[15] Rupa Subramanya, "Report: DEI Is Transforming the National Science Foundation," The Free Press, October 9, 2024. https://www.thefp.com/p/dei-national-science-foundation-grants-report.
[16] See also: Leif Rasmussen, "Increasing Politicization and Homogeneity in Scientific Funding: An Analysis of NSF Grants, 1990-2020," Center for the Study of Partisanship and Ideology, November 16, 2021. https://www.cspicenter.com/p/increasing-politicization-and-homogeneity-in-scientific-funding-an-analysis-of-nsf-grants-1990-2020.
[17] Jessica Adkins, "Arc Institute Scientists Discover Next-Generation System for Programmable Genome Design," Arc Institute, June 26, 2024. https://arcinstitute.org/news/news/bridge.
[18] Ben Reinhardt, "Fund Organizations, Not Projects: Diversifying America's Innovation Ecosystem with a Portfolio of Independent Research Organizations," Institute for Progress, January 19, 2022.

The real economy is overregulated

Zooming out, the common factor behind slowing scientific and technological progress is simply the extent to which we overregulate the real economy.[19] Innovation does not begin and end in the lab. Rather, most practical innovation results from a process of "learning by doing" – applying, iterating and scaling discoveries with feedback from the real world.[20] From nuclear energy[21] to civil supersonic aviation,[22] entire branches of the human technology tree have been prematurely pruned by de facto regulatory prohibitions.

Unfortunately, scaling and iterating technologies is an area where China excels. While America has several world class drone, battery and robotics companies, for instance, China has the capacity to manufacture drones, batteries and robots by the millions of units. This capacity for scale leads to genuine scientific insight, which feeds back into better products and deeper technological moats.

Tearing down the regulation and bureaucracy inhibiting America's capacity to innovate and build in the real world is thus imperative to rebooting our scientific and industrial prowess. This is especially true in a world where Artificial Intelligence automates large swaths of knowledge work, leaving physical industries like energy and manufacturing as the final determinant of a country's competitive edge.

AI is already revolutionizing the scientific enterprise itself. While scientists have made use of powerful computational tools for decades, the advent of superintelligent AI agents able to test hypotheses and run experiments in parallel has the potential to drive an unprecedented speed-up in the rate of scientific discovery.[23] The federal government could support AI-driven science by unlocking large datasets, such as the Department of Energy's extensive trove of material science data, to train the next generation of foundation models. Such models could then be deployed with AI agents controlling

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https://ifp.org/fund-organizations-not-projects-diversifying-americas-innovation-ecosystem-with-a-portfolio-of-independent-research-organizations/.

[19] See: Eli Dourado, "Why are we stagnating?" Recorded at the 2024 Progress Conference in Berkeley, CA. https://www.youtube.com/watch?v=5P_ICoeznjQ

[20] Samuel Hammond, "OpenAI's big lesson for science policy," Second Best, April 11, 2023. https://www.secondbest.ca/p/openais-lessons-for-science-policy.

[21] Christopher Koopman and Eli Dourado, "A Lawless NRC Obstructs Safe Nuclear Power," Wall Street Journal, January 5, 2025. https://www.wsj.com/opinion/let-states-run-small-nuclear-reactors-energy-policy-f92488ae.

[22] Eli Dourado and Samuel Hammond, "Make America Boom Again: How to Bring Back Supersonic Transport," Mercatus Center, October 27, 2016. https://www.mercatus.org/research/research-papers/make-america-boom-again.

[23] Dario Amodei, "Machines of Loving Grace: How AI Could Transform the World for the Better," October 2024. https://darioamodei.com/machines-of-loving-grace.

"self-driving labs" that automate experimental research, dramatically increasing the pace of discovery.[24]

But again, a scientific discovery only matters to America's competitiveness to the extent it leaves the lab and affects the real world. AI could unleash a tsunami of new medical treatments, for instance, only to be bottlenecked by the FDA's cumbersome clinical trial process.[25] Indeed, maximizing the full up-side from AI – and adapting to the sheer pace and volume of new economic activity – will likely require Congress to radically rethink and reconfigure many 20th century institutions, not just reform them on the margin.

Consider the sudden rise of DeepSeek as a formidable Chinese competitor in the race to AGI. With so little separating China and America's frontier AI capabilities on a technical level, America's lead in AI is only as strong as our lead in computing infrastructure. This infrastructure manifests in the form of a growing ecosystem of advanced AI chips in physical data centers, each with enormous energy demands.[26]

Export controls on advanced AI chips and semiconductor manufacturing equipment are thus imperative to the U.S. maintaining its leadership position in AI.[27] But in the years ahead, this hardware advantage will wither without aggressive investment in energy production and related infrastructure. While advanced geothermal shows real promise, fully renewable energy is unlikely to come online fast enough.[28] The unprecedented energy demands of AI infrastructure—as much as 5 GW going to a single data center—will thus be met in large part by behind-the-meter (BTM) gas generation. Co-locating data centers with dedicated power generation allows one to bypass the constraints of our inadequate power grid, but comes with significant regulatory challenges of its own, from Clean Air Act requirements and environmental reviews to state utility laws.[29] Across the

[24] Dean Ball, "Accelerating Materials Science with AI and Robotics," Federation of American Scientists Day One Project, November 26, 2024. https://fas.org/publication/accelerating-materials-science-with-ai-and-robotics/.
[25] Willy Chertman and Ruxandra Tesloianu, "The Case for Clinical Trial Abundance," Institute for Progress, December 18th 2024. https://ifp.org/the-case-for-clinical-trial-abundance/.
[26] Samuel Hammond, "The Scramble for AI Computing Power," American Affairs Journal, Summer 2024. https://americanaffairsjournal.org/2024/05/the-scramble-for-ai-computing-power/.
[27] Samuel Hammond, "DeepSeek's Success Reinforces the Case for Export Controls," Foundation for American Innovation, January 30, 2025.
[28] Arnab Datta and Tim Fist, "Compute in America: A Policy Playbook," Institute for Progress, February 3, 2025. https://ifp.org/special-compute-zones/.
[29] Thomas Hochman, "Federal, State, and Local Regulatory Barriers to Data Center Energy Infrastructure," Foundation for American Innovation, December 4, 2025. https://www.thefai.org/posts/federal-state-and-local-regulatory-barriers-to-data-center-energy-infrastructure.

board, winning the AI race will thus come down less to our technical supremacy than whether we have the political will to clear these self-imposed barriers.

American leadership in AI matters at both the frontier and in the realm of open source. Given their greater controllability and localizability, open source AI models will likely be the default for critical infrastructure providers around the world. They are also often the only models available to scientists and researchers. This calls for a strategy of "open source diplomacy" to ensure the best open models remain American-made.[30] This is especially important given the potential for open models to contain undetectable backdoors or "sleeper agents" that can be triggered to alter a model's behavior.[31]

The only way to rule out whether or not an AI model is contaminated is to fully audit its code and training data. Today, the U.S. government's primary in-house capacity for AI model testing and evaluation lies within the U.S. AI Safety Institute. To advance America's open source diplomacy, the AISI could be retooled to perform voluntary audits of AI models – both open and closed – to certify their security and reliability. As the founding member of a consortium of 280 similar AI institutes internationally, the AISI seal of approval would thus support the export and diffusion of American AI models worldwide.

In closing, a forward-thinking, less bureaucratic, and merit-based approach to federal science policy is key to maintaining U.S. technology leadership. That means fostering an environment where innovation is unburdened by excessive regulation and where AI and other emerging technologies are rigorously supported and secured. I remain optimistic that with thoughtful policy, the United States will continue to pioneer breakthroughs that drive economic growth and national security, and ultimately lead the world into a new golden age.

Thank you for your time and consideration.

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[30] Ben Brooks and Michelle Fang, "US leadership in AI requires open-source diplomacy," TheHill, January 12, 2025. https://thehill.com/opinion/technology/5079721-china-ai-open-source-threat/.
[31] Benj Edwards, "AI poisoning could turn models into destructive 'sleeper agents,' says Anthropic," ArsTechnica, January 15, 2024. https://arstechnica.com/information-technology/2024/01/ai-poisoning-could-turn-open-models-into-destructive-sleeper-agents-says-anthropic/.