

Office of Science and Technology Policy

Accelerating the American Scientific Enterprise

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Introduction

China's science and technology ecosystem has emerged as a key driver of Beijing's geopolitical ambitions to surpass the United States. A consistent priority under the tenure of paramount leader Xi Jinping, the Chinese Communist Party (CCP) has invested billions over the past two decades in building a state-led scientific enterprise capable of underwriting economic prosperity and bolstering the strength of the People's Liberation Army (PLA). China's scientific enterprise has excelled at delivering a range of breakthroughs in fields critical for national security due to new institutions that coordinate between government agencies and private firms, rising military spending, and intense political focus. These sectors include artificial intelligence (AI), advanced materials, fusion technology, and biotechnology — all of which align with the PLA's conception of contemporary conflict as a realm that prioritizes precision, innovation, and execution above all else.¹

Increasingly, these investments are reinforced by a whole-of-state strategy that integrates scientific research with industrial policy, cyber operations, and military modernization, enabling Beijing not only to develop new capabilities, but to acquire them through exploitation of foreign research ecosystems.

While the United States remains a global leader in science and technology, China is rapidly gaining ground. Washington must reform its approach to America's scientific enterprise to compete. While private investment in research and development has grown, federal funding for the sciences is at historic lows.² Even in areas where funding remains stable, however, productivity has declined, with fewer breakthroughs despite a steady influx of highly trained scientists.³ These trends compound long-standing issues within the American science sector, including persistent challenges in workforce development, adversarial industrial and academic espionage, and slipping academic performance compared to global peers.

History has shown that U.S. leadership in discovery alone is insufficient when adversaries can exploit weak and vulnerable cyber systems to steal intellectual property, replicate scientific advances, and achieve comparable capabilities at a fraction of the cost.

¹ Craig Singleton and Jack Burnham, "From Parade to Battlefield: LiDAR at the Core of China's Military Modernization," *Foundation for Defense of Democracies*, September 22, 2025. (<https://www.fdd.org/analysis/2025/09/22/from-parade-to-battlefield-lidar-at-the-core-of-chinas-military-modernization>)

² James Pethokoukis, "US Federal Research Spending Is at a 60-year Low. Should We Be Concerned?" *American Enterprise Institute*, May 11, 2020. (<https://www.aei.org/economics/us-federal-research-spending-is-at-a-60-year-low-should-we-be-concerned/>)

³ Navin Girishankar and Chris Borges, "The Genesis Mission: Can the United States' Bet on AI Revitalize U.S. Science?" *Center for Strategic and International Studies*, December 4, 2025. (<https://www.csis.org/analysis/genesis-mission-can-united-states-bet-ai-revitalize-us-science>)

This historical pattern is especially relevant as emerging technologies increasingly function as force multipliers across all domains of national power. Advances in AI and quantum science are not occurring in isolation. They are developing in parallel with increasingly sophisticated cyber capabilities that allow adversaries to acquire sensitive data, model system behavior, and exploit structural weaknesses.

Absent deliberate investment in cyber defense, system resilience, and enterprise readiness, future U.S. breakthroughs risk being rapidly commoditized by adversaries rather than reinforcing long-term American leadership.

Artificial intelligence and quantum science should be understood not as standalone technology domains, but as cross-cutting force multipliers that accelerate progress across nearly every area of national capability. Artificial intelligence increases the speed, scale, and adaptability of existing systems. It enhances data analysis, logistics, cyber operations, intelligence fusion, materials discovery, and decision support. At the same time, it lowers barriers to entry for sophisticated cyber exploitation and enables adversaries to operate at machine speed. Quantum science represents a parallel and compounding shift, with the potential to advance sensing, timing, navigation, optimization, and computation, while simultaneously threatening the cryptographic and trust foundations on which digital systems depend.

This request for information response will propose a revised effort to direct federal resources toward two complementary efforts: revitalizing basic research and pursuing “big science.” These areas of focus will complement current efforts such as the Genesis Mission and allow the federal government to efficiently invest in the American scientific enterprise, bringing to bear unique capabilities that provide the foundation for long-term innovation and produce productivity-enhancing technologies to supercharge economic growth and enhance affordability.⁴ To succeed, these investments must be paired with policies that protect scientific advantage, harden cyber and digital infrastructure, and ensure that force-multiplying technologies strengthen U.S. resilience rather than creating new vectors for exploitation.

This dual-pronged approach should be supported by a commitment to stable, secure funding levels, and fulfilling President Donald Trump’s long-standing desire to attract international talent and integrate AI into the scientific discovery process.

⁴ Executive Order 14363, “Launching the Genesis Mission,” November 24, 2025.
(<https://www.federalregister.gov/documents/2025/11/28/2025-21665/launching-the-genesis-mission>)

Dissecting China's Scientific Model

China's science pipeline has emerged as a near-peer competitor to the United States, not only because of the scale of Beijing's investment, but because of its ability to integrate scientific research with industrial policy, cyber operations, and military modernization into a single strategic system, with Beijing combining unprecedented funding, reforms, and adoption strategies to develop its economy and modernize its military.

Despite facing severe economic headwinds, China continues to pour investments into its science sector, with its projected 2026 budget including \$172 billion for scientific endeavors, roughly on par with Washington's estimated \$193 billion.⁵ This parity obscures Beijing's growing advantage, as China's research and development ecosystem benefits from lower costs, state coordination, and the ability to exploit foreign research and intellectual property, making its investments more valuable when adjusted for cost efficiency.⁶ When paired with cyber-enabled industrial and academic espionage, Beijing is often able to achieve comparable capabilities without bearing the full cost, risk, or timeline of original research.

Alongside this top-line spending, China's efforts to fuse together its science sector and military industrial base under the heading of "military-civil fusion" ensures that Beijing's ever-increasing military budget also benefits its broader civilian research and development efforts.⁷ This model allows advances in artificial intelligence, materials science, robotics, and emerging computing technologies to transition rapidly from civilian research into military applications, reinforcing the People's Liberation Army's modernization while simultaneously strengthening China's commercial technology base.

China has paired these expenditures with profound policy reforms intended to promote scientific research and technological development. With Xi touting China's role as a "science and technology great power," both central and local officials have subsidized new science parks, encouraged private-public collaboration, and eased regulatory burdens on bringing to market

⁵ Jack Burnham and Johanna Yang, "Aiming for Parity With U.S., China Announces Increase in Science and Technology Spending," *Foundation for Defense of Democracies*, March 19, 2025. (https://www.fdd.org/analysis/policy_briefs/2025/03/19/aiming-for-parity-with-u-s-china-announces-increase-in-science-and-technology-spending)

⁶ Trelysa Long, "China Is Catching Up in R&D—and May Have Already Pulled Ahead," *Information Technology and Innovation Foundation*, April 9, 2025. (<https://itif.org/publications/2025/04/09/china-catching-up-rd-may-have-already-pulled-ahead>)

⁷ Jack Burnham and Johanna Yang, "Chinese Leader Xi Jinping Calls for Greater Local Support for Military Modernization," *Foundation for Defense of Democracies*, March 13, 2025. (https://www.fdd.org/analysis/policy_briefs/2025/03/13/chinese-leader-xi-jinping-calls-for-greater-local-support-for-military-modernization); Emily de La Bruyère and Nathan Picarsic, "Defusing Military-Civil Fusion: The Need to Identify and Respond to Chinese Military Companies," *Foundation for Defense of Democracies*, May 27, 2021. (<https://www.fdd.org/analysis/2021/05/26/defusing-military-civil-fusion>)

new technologies, such as novel medical treatments.⁸ These efforts have partially been driven by top-down institutional changes, particularly the 2023 establishment of the Central Science and Technology Commission within the Ministry of Science and Technology, an agency tasked with pursuing the country’s scientific priorities across agencies.⁹ This centralized coordination enables Beijing to rapidly align scientific priorities with national security objectives and to direct resources toward technologies that function as force multipliers across economic, military, and cyber domains.

While attempting to fulfill its priorities, China has focused on applied research — pursuing improvements on pre-existing ideas and using science as a solution to a current problem.¹⁰ This approach falls in line with Beijing’s overall emphasis to develop “new qualitative productive forces” and target specific sectors for innovation, such as battery technology, material science, and robotics.¹¹ This applied focus, when combined with access to stolen or exfiltrated foreign research data, allows China to compress development timelines and reduce uncertainty, accelerating the translation of scientific progress into operational capability.

Emerging technologies further amplify this model. Artificial intelligence accelerates analysis, automation, and cyber exploitation, while quantum science promises advances in sensing, timing, navigation, and computation that could undermine adversary systems while strengthening China’s own. Together, AI and quantum function as cross-cutting force multipliers, enabling Beijing to convert scientific investment into strategic advantage across multiple domains simultaneously.

⁸ Jack Burnham and Johanna Yang, “Aiming for Parity With U.S., China Announces Increase in Science and Technology Spending,” *Foundation for Defense of Democracies*, March 19, 2025. (https://www.fdd.org/analysis/policy_briefs/2025/03/19/aiming-for-parity-with-u-s-china-announces-increase-in-science-and-technology-spending); “China’s Silicon Valley is transforming China, but not yet the world,” *The Economist* (UK), July 11, 2019. (<https://www.economist.com/china/2019/07/11/chinas-silicon-valley-is-transforming-china-but-not-yet-the-world>)

⁹ Barry Naughton, Tai Ming Cheung, Siwen Xiao, Yaosheng Xu, and Yujing Yang, “Reorganization of China’s Science and Technology System,” *UC Institute on Global Conflict and Cooperation*, July 2023. (https://ucigcc.org/wp-content/uploads/2023/08/2023_wp10_naughton_v2-FINAL.pdf)

¹⁰ Emily Weinstein, Channing Lee, Ryan Fedasiuk, Anna Puglisi, “China’s State Key Laboratory System: A View into China’s Innovation System,” *Center for Security and Emerging Technology*, June 2022. (<https://cset.georgetown.edu/wp-content/uploads/CSET-Chinas-State-Key-Laboratory-System.pdf>); Jack Burnham, “New Scientific Agreement Between U.S. and China Could Spur Unintended Chinese Military Development,” *Foundation for Defense of Democracies*, December 19, 2024. (<https://www.fdd.org/analysis/2024/12/19/new-scientific-agreement-between-u-s-and-china-could-spur-unintended-chinese-military-development>); Jack Burnham and Miles Kershner, “U.S. Authorities Charge Chinese Nationals With Smuggling Biological Samples,” *Foundation for Defense of Democracies*, June 11, 2025. (https://www.fdd.org/analysis/policy_briefs/2025/06/11/u-s-authorities-charge-chinese-nationals-with-smuggling-biological-samples)

¹¹ Craig Singleton, “Countering Threats Posed by the Chinese Communist Party to U.S. National Security,” *Testimony before the House Committee on Homeland Security*, March 5, 2025. (<https://www.fdd.org/analysis/2025/03/05/countering-threats-posed-by-the-chinese-communist-party-to-u-s-national-security>)

Taken together, China’s scientific model demonstrates that competition is no longer limited to discovery alone. It is a contest over who can most effectively integrate science with cyber exploitation, military power, and system-level resilience, achieving dominance not only through innovation, but through the ability to exploit and defend digital and technological ecosystems at scale.

The Enduring Advantages of the American Scientific Enterprise

In contrast, the strengths of American science come from its relentless focus on basic research, its strong model of public-private cooperation, and its enduring international appeal. Unlike state-directed systems optimized for short-term replication and application, the U.S. scientific enterprise has historically excelled at producing foundational discoveries that enable entire classes of future capability. Though effective in producing select results, China’s scientific enterprise struggles to string together independent discoveries, hindering its efforts to deliver paradigm shifting inquiry — an issue recognized by even the CCP.¹²

Rather than shift focus exclusively onto applied science, the United States has continuously funded basic research as the foundation of its grant-writing process, allowing scientists to develop novel avenues of inquiry and ensuring that both the public and private sector can benefit from the accumulation of openly available research. This model creates depth rather than speed alone, allowing innovations to compound over time rather than remain limited to single-use applications. While China’s style of applied research may appear appealing given its capacity to generate short-term returns, America’s advantage is its patience in allowing hundreds of discoveries to be strung together, allowing Washington to call upon a deep, talented pool of expertise across a broad range of policy challenges.

This approach has shaped the foundation of American innovation, whether by the National Institutes of Health funding research that allows pharmaceutical firms to pioneer new treatments or National Science Foundation grants producing the groundwork for the development of AI.¹³ While the private sector has increased its spending on research and development, the federal

¹² Jack Burnham, “New Scientific Agreement Between U.S. and China Could Spur Unintended Chinese Military Development,” *Foundation for Defense of Democracies*, December 19, 2024. (<https://www.fdd.org/analysis/2024/12/19/new-scientific-agreement-between-u-s-and-china-could-spur-unintended-chinese-military-development>)

¹³ Berna Uygun, Steven Ferguson, and Michael Pollack, “Hiding in Plain Sight: Surprising Pharma and Biotech Connections to NIH’s National Cancer Institute,” *Journal of Commercial Biotechnology*, July 21, 2022. (<https://pmc.ncbi.nlm.nih.gov/articles/PMC9302569>); “Building the Foundations of Artificial Intelligence,” *National Science Foundation*, accessed December 16, 2025. (<https://www.nsf.gov/impacts/ai>)

government continues to play a key role, particularly in biomedical research, which often serves a dual-use purpose across both civilian and military fields.

This public investment model ensures that force-multiplying technologies, including AI and emerging quantum applications, are rooted in broad scientific ecosystems rather than narrowly optimized for single missions or actors.

Public-private cooperation remains a cornerstone of the American scientific enterprise, such as the use of Federal Advisory Committees of non-government experts to direct federal research priorities. Federal law incentivizes universities to apply for government research funding by allowing labs to maintain patents on their discoveries funded by federal research grants.¹⁴ This distributed model of innovation contrasts sharply with centralized, state-controlled systems and provides resilience against single points of failure, capture, or distortion.

America's science pipeline has been fueled by gaining and maintaining access to top international talent, allowing the United States to grow its own research and development sector while simultaneously weakening those of its gravest adversaries. Over the past eight decades, the United States has benefited immensely from a consistent flow of international students capable of driving scientific discovery and developing their own laboratories. Rather than replacing homegrown talent, this influx has driven a self-perpetuating cycle of American innovation, as both foreign and domestic scholars build on their findings and prepare to develop the next generation.

This openness, however, also introduces risk. As adversaries increasingly exploit cyber vulnerabilities, academic openness and digital collaboration environments have become targets for intellectual property theft and data exfiltration. Preserving America's scientific advantage therefore requires pairing openness with robust cyber defense, research security, and enterprise-level readiness.

Even China has realized this unique American advantage, with Beijing having introduced changes to its visa policy in October to try to mimic America's successes by allowing foreign science and technology workers an expanded pathway to enter the country.¹⁵ The United States

¹⁴ Navin Girishankar and Chris Borges, "The Genesis Mission: Can the United States' Bet on AI Revitalize U.S. Science?" *Center for Strategic and International Studies*, December 4, 2025. (<https://www.csis.org/analysis/genesis-mission-can-united-states-bet-ai-revitalize-us-science>); Section 6(a) of Pub. L. 96–517, codified at 35 U.S.C. §§ 200-212. (<https://www.govinfo.gov/content/pkg/USCODE-2011-title35/html/USCODE-2011-title35-partII-chap18.htm>)

¹⁵ Jack Burnham and Annie Fixler, "China Is Winning the AI Race With America's Own Manhattan Project Lessons," *The National Interest*, September 1, 2025. (<https://www.fdd.org/analysis/2025/09/01/china-is-winning-the-ai-race-with-americas-own-manhattan-project-lessons>)

must not only preserve this advantage, but harden it, ensuring that talent, research, and digital infrastructure are protected from exploitation by increasingly capable adversaries.

Taken together, the enduring strength of the American scientific enterprise lies not only in what it discovers, but in how it sustains, integrates, and defends those discoveries over time. In an era where artificial intelligence and quantum science function as force multipliers across all domains of national power, U.S. leadership will depend on maintaining the openness, depth, and creativity of its research ecosystem while simultaneously investing in the cyber resilience and readiness necessary to prevent adversaries from converting American innovation into strategic advantage at U.S. expense.

Recommendations: Embracing Basic Research and “Big Science”

The United States should adopt a two-part, complementary strategy for improving its scientific establishment: expanding its focus on basic research and pioneering a return to “big science” as a central concept in federal research funding. This strategy must be explicitly designed to translate discovery into durable national advantage by pairing innovation with cyber defense, system resilience, and protection of intellectual property. This strategy should be supported by stable federal funding, workforce prioritization, and adopting AI into overall science strategy, while accounting for emerging force multipliers such as quantum science that will shape future competition across all domains.

1. Pursuing Basic Research and “Big Science”

In confronting a surging Chinese science sector, the United States must make American science great again by remembering its past, adopting a strategy that combines its support for basic research with its dedication to large-scale scientific inquiry. Washington’s commitment to basic research funding as the cornerstone of its scientific enterprise remains its most critical edge — it drives novel discoveries, underpins broad-based prosperity, and provides a public good that cannot be fully replicated by the private sector. This commitment also creates depth and optionality that adversaries focused on short-cycle replication struggle to match.

Moreover, this advantage will only grow more salient during a period of intensifying broad-based competition, as the United States can pivot toward a consistent source of innovation to provide economic prosperity and military preparedness. In an environment where adversaries exploit cyber vulnerabilities to steal and replicate innovation, basic research provides resilience by generating a continuous pipeline of new knowledge rather than a finite set of harvestable outcomes.

This focus should be complemented with a return to “big science,” such as the Apollo Program or Operation Warp Speed, that require a whole-of-nation effort to accomplish. These projects, which thrived during the Cold War, provide several valuable outputs unable to be achieved via other means, including furthering national strategic priorities, producing lasting productivity-enhancing infrastructure, and generating a high degree of spillover into the commercial sector. In the current strategic environment, big science initiatives should also be designed to harden the resulting capabilities against cyber exploitation and long-term system compromise.

This is particularly the case within the private sector, as firms involved in “big science” projects tend to become more competitive and invest in their own research and development enterprises, multiplying the impact of government investment.¹⁶ As such, the Trump administration should consider proposing a series of national science projects aimed at ensuring American commercial and military leadership, including national prizes related to achievements in biotechnology, quantum computing, and fusion energy, with explicit requirements for security, resilience, and lifecycle readiness embedded from inception.

2. Stable Funding for Federal Science Priorities

This strategy should be supported by stable increases in federal funding for major grant-writing institutions, particularly the National Science Foundation, National Institutes of Health, and the National Institute of Standards and Technology. These institutions, along with the Department of Defense and the Department of Energy, direct most federal science spending, particularly most basic research funding. The administration should work with Congress to steadily raise federal research spending to nearly 6 percent of gross domestic product, close to its historic average following the end of the Apollo Program.¹⁷

Moreover, the administration should consider doubling the budget of the National Institutes of Health, as occurred during late 1990s and early 2000s during a period of profound biomedical innovation within the field of genetics.¹⁸ These investments should explicitly support research that underpins force-multiplying technologies while strengthening the cyber and digital foundations upon which they depend.

¹⁶ Martina Dal Molin, Deepa Scarrà, Andrea Piccaluga, and Veronica Valsecchi, “Technology transfer from procurement relationships in big science contexts,” *Industry and Higher Education*, December 16, 2022. (<https://journals.sagepub.com/doi/abs/10.1177/09504222221145434>)

¹⁷ James Pethokoukis, “US Federal Research Spending Is at a 60-year Low. Should We Be Concerned?” *American Enterprise Institute*, May 11, 2020. (<https://www.aei.org/economics/us-federal-research-spending-is-at-a-60-year-low-should-we-be-concerned/>)

¹⁸ “Analysis of Federal Funding for Research and Development in 2022: Basic Research,” *National Science Foundation*, August 15, 2024. (<https://nces.nsf.gov/pubs/nsf24332>)

3. Strategic Application of World-Class Talent

The United States should also ensure that it remains the top global destination for attracting and keeping scientific talent. Throughout its history, the American scientific enterprise has benefited from its capacity to integrate international talent to achieve national priorities — strengthening the United States and weakening its greatest adversaries. To that end, the administration should work with Congress to achieve the president’s campaign promise to ensure that all foreign-born university and college students receive priority access to green cards.¹⁹

The administration should also ensure that American research remains secure from foreign espionage, particularly in strategic fields such as high-intensity physics, biology, aeronautics and advanced computing.²⁰ Openness must be paired with research security, cyber defense, and enterprise readiness to prevent adversaries from exploiting academic collaboration and digital infrastructure to appropriate U.S. scientific advances at low cost.

4. Build on the Success of the ‘Genesis Mission’

Building on its current efforts, the Trump administration should continue to pull AI into the American scientific enterprise as a source of productivity enhancement, innovation, and strategic benefit. Under the auspices of the recently launched Genesis Mission, the Department of Energy should ensure that its system of national labs prioritize offering a replicable model for integrating AI into the process of scientific discovery.²¹

This effort should be paired with allowing private sector AI developers, particularly those working to produce open-source models, to access national datasets, while pursuing data-sharing agreements with like-minded allies and partners. As AI accelerates discovery, these efforts should also be leveraged to identify vulnerabilities, improve system resilience, and prepare the scientific enterprise for future threats enabled by advances in quantum science and other emerging technologies.

¹⁹ Catherine E. Shoichet, “Trump has vowed to give green cards to college grads. Could that actually happen?” *CNN*, December 6, 2024. (<https://www.cnn.com/2024/12/06/politics/green-cards-college-graduates-trump-cec>)

²⁰ Ken Moriyasu, “‘Agroterrorism’ arrest in US spurs calls to bring back China Initiative,” *Nikkei Asia*, June 5, 2025. (<https://asia.nikkei.com/politics/international-relations/us-china-tensions/agroterrorism-arrest-in-us-spurs-calls-to-bring-back-china-initiative>)

²¹ Executive Order 14363, “Launching the Genesis Mission,” November 24, 2025. (<https://www.federalregister.gov/documents/2025/11/28/2025-21665/launching-the-genesis-mission>)

Conclusion

As China continues to advance its own scientific enterprise with the aim of displacing the United States as a preeminent global power, Washington must expand its efforts to maintain its scientific and technological edge over Beijing. This competition is no longer defined solely by who discovers first, but by who can best translate discovery into enduring national advantage while preventing adversaries from exploiting, stealing, or weaponizing innovation through cyber means.

In seeking to reform America's scientific enterprise, the Trump administration should prioritize both the smallest and largest aspects of science, efficiently allocating federal resources to maximize impact while encouraging private sector efforts to commercialize new findings and diffuse them across both civilian and military sectors. This approach must explicitly account for the reality that artificial intelligence and quantum science now function as force multipliers across all domains of national power, accelerating both innovation and exploitation.

History demonstrates that U.S. leadership in science cannot be sustained if breakthroughs are rapidly commoditized by adversaries who exploit weak cyber defenses and vulnerable digital infrastructure. As a result, federal science policy must pursue innovation and resilience together, pairing investments in basic research and big science with policies that harden cyber systems, protect intellectual property, and ensure enterprise-level readiness for emerging threats.

If the United States succeeds, it will not only remain the world's leading engine of scientific discovery, but also the nation best positioned to defend, operationalize, and sustain those discoveries over time. In an era of accelerating competition shaped by AI, quantum, and converging technologies, America's ability to protect and integrate its scientific advantage will determine whether leadership endures or erodes.

Thank you for considering our response. We look forward to seeing how our input is incorporated into the office's ongoing policy work.