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**Before the House Committee on Science, Space, and Technology**

**"The State of U.S. Science and Technology:**
**Ensuring U.S. Global Leadership."**

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## Oral Testimony Summary

Chairman Babin, Ranking Member Lofgren, members of the Committee and distinguished participants. It is a privilege to testify on the state of U.S. science and technology, which is critically important to our Nation's global economic competitiveness and national security. It is my honor to lead research and technology transfer at Colorado School of Mines, a top tier U.S. research university rated in the top 3 engineering programs in America.

I recently served our Nation as Director of the National Institute of Standards and Technology and prior, with two of the U.S. Department of Energy national labs. My leadership experience spans public and private sectors—as executive, entrepreneur and investor.

Two decades ago, the United States was the undisputed global leader in science and technology, and in driving innovation for economic value creation. Today, however, by many internationally recognized measures, America's global leadership position in the majority of the critical technology fields has been overtaken by China.[1] The U.S. still holds the clear lead in 7 of 64 technology categories, whereas China is currently

[1] Research and Development: U.S. Trends and International Comparisons: https://ncses.nsf.gov/pubs/nsb20246

leading in the rest.[2,3] China now leads in numbers of patents[4] and highly cited research publications in respected journals,[5] while also seeking to dominate global technology standards.[6] At the same time, the U.S. has allowed the strength of our intellectual property protections to decline.[7,8]

We are in a period where crisis presents America with great opportunity.[9] The U.S. must take a new strategic approach to the future of research and S&T advancement that engages across government agencies. We must leverage collaboration and investments with the private sector,[10] bolster education at all levels, and engage with our national R&D, intellectual property, standards and innovation enterprise. We have the chance to drive great synergies in federal R&D investment, through a national S&T and innovation strategy.

Investment in public-sector R&D is an essential part of our global competitiveness.[11] Its value and high rates of investment return[12] are not

[2] ASPI's Two-Decade Critical Technology Tracker, https://www.aspi.org.au/report/aspis-two-decade-critical-technology-tracker

[3] State of the Science Address: 2024, https://www.nationalacademies.org/news/2024/06/in-state-of-the-science-address-nas-president-urges-improvements-to-k-12-science-education-in-order-to-strengthen-the-u-s-stem-workforce

[4] https://itif.org/publications/2023/01/23/wake-up-america-china-is-overtaking-the-united-states-in-innovation-capacity/

[5] https://www.nationalacademies.org/news/2024/06/in-state-of-the-science-address-nas-president-urges-improvements-to-k-12-science-education-in-order-to-strengthen-the-u-s-stem-workforce

[6] What Washington Gets Wrong About China and Technical Standards: https://carnegieendowment.org/research/2023/02/what-washington-gets-wrong-about-china-and-technical-standards?lang=en

[7] Intellectual Property Rights in the U.S.-China Innovation Competition: https://www.csis.org/analysis/intellectual-property-rights-us-china-innovation-competition

[8] Losing the Lead: Why the United States Must Reassert Itself as a Global Champion for Robust IP Rights https://itif.org/publications/2023/06/12/losing-the-lead-why-united-states-must-reassert-itself-as-global-champion-for-robust-ip-rights/

[9] Will America Squander Its New Sputnik Moment? https://www.csis.org/analysis/will-america-squander-its-new-sputnik-moment

[10] Research and Development: U.S. Trends and International Comparisons: https://ncses.nsf.gov/pubs/nsb20246

[11] Competing in the Next Economy. Innovating in the Age of Disruption and Discontinuity. A Call to Action: https://compete.org/wp-content/uploads/coc-disruption_discontinuity-call-to-action-final_12.13.24.pdf

[12] Federal R&D Funding Is Even More Valuable Than Washington Thinks: https://www.aei.org/economics/federal-rd-funding-is-even-more-valuable-than-washington-thinks/

always fully appreciated.[13] Substantial U.S. industrial productivity gains[14] and the majority of American technology startups have originated from public R&D funding,[15] delivering innovations critical to economic and national security.[16] Preserving the integrity of the Bayh-Dole Act for U.S. innovation is essential,[17,18] and we must now implement much-needed modernization of the Stevenson-Wydler Act for effective partnerships and to deliver increased innovation outcomes from federal research to the commercial marketplace.[19] Facilitating high-efficiency collaborations between universities, government, industry and science philanthropy is key to America's success in S&T.[20]

The future U.S. workforce must have the skills necessary for the STEM-related careers that drive the innovation economy. STEM education must be prioritized, beginning with K-12 education and the trades, and cultivating relevant competences up to the highest educational levels. A prepared workforce is essential for rebuilding and reshoring our advanced manufacturing base for all industries in the future economy, and to produce and utilize necessary critical materials.

We have work to do. America's K-12 educational outcomes[21] have fallen behind other nations. Attracting and retaining talented people from other nations are also essential contributors to U.S. S&T and our innovation

[13] Fieldhouse, A.J., & Mertens, K. (2023). The Returns to Government R&D: Evidence from U.S. Appropriations Shocks. Working paper. https://andrewjfieldhouse.com/wp-content/uploads/2023/12/The_Return_to_Government_R_D_manuscript.pdf

[14] NBER "Estimating the Economic and Budgetary Effects of Research Investments" https://www.nber.org/papers/w33402)

[15] Dyèver, A. (2024) Public R&D Spillovers and Productivity Growth: https://www.ecb.europa.eu/press/conferences/ecbforum/shared/pdf/2024/EFCB_2024_Dyevre_paper.en.pdf

[16] Fleming, L., Greene, H., Li, G., Marx, M., & Yao, D. A. (2019). Government-funded research increasingly fuels innovation. *Science*, *364*(6446), 1139–1141. https://doi.org/10.1126/science.aaw2373

[17] Copan, W.G., America's Goose that Lays the Golden Eggs: https://rollcall.com/2021/04/22/americas-goose-that-lays-the-golden-eggs/

[18] Unleashing American Innovation, NIST Green Paper SP1234, https://www.nist.gov/unleashing-american-innovation/green-paper

[19] ROI Initiative Status Update: Legislative Package Sent to Congress: https://www.nist.gov/news-events/news/2020/12/roi-initiative-status-update-legislative-package-sent-congress

[20] McNutt, M. (2024) Keeping America "Science Strong," https://pmc.ncbi.nlm.nih.gov/articles/PMC11459151/

[21] U.S. Department of Education Issues Statement on the Nation's Report Card: https://www.ed.gov/about/news/press-release/us-department-of-education-issues-statement-nations-report-card

economy.[22] Further, international scientific collaborations with like-minded nations enable acceleration of discoveries and build diplomacy supporting America's position abroad.[23]

Over the past two decades, the bureaucracy and administrative burdens associated with American publicly funded R&D have also skyrocketed.[24] This bureaucracy has increased the costs and reduced the agility of the U.S. research enterprise.

We must continually increase efficiencies in S&T, build interagency coordination, and strengthen intellectual property, technology standards leadership and our international partnerships. We must further modernize legislation and policies to remove barriers and incentivize innovation for America to continue to lead the world.

Thanks to this Committee for your important work toward securing the science, technology and innovation leadership for U.S. economic and national security. I look forward to answering questions you may have.

[22] Foreign-born Share of the U.S. STEM Workforce, https://www.csis.org/analysis/innovation-lightbulb-foreign-born-share-us-stem-workforce

[23] Preserving America's Place in Global Science, T. Smith (2024): https://nautil.us/preserving-americas-place-in-global-science-1031512/

[24] Changes in Federal Research Requirements Since 1991: https://www.cogr.edu/changes-federal-research-requirements-1991