■ Frontier Science & Technology

Launching X-Labs for Transformative Science Funding

Caleb Watney

SUMMARY

The traditional, university-driven science funding model that has dominated our research landscape over the last 75 years is beginning to show its age. To maintain US scientific leadership, the White House should coordinate the launch of 20 new "X-Labs" by 2026, each funded at $10 million to $50 million per year through reallocated National Science Foundation (NSF), National Institutes of Health (NIH), and Department of Energy (DOE) budgets. These labs would be independent research institutions selected through a competitive review process, designed to accelerate team-based, high-risk, high-reward, basic science in fields such as biotechnology, materials science, next-generation energy, and chronic disease research—addressing research problems that university-imposed structures and private markets are not well-suited to solve.

X-Labs would address a critical gap in federal funding by providing long-term, flexible block grants to innovative organizations outside of traditional academic settings. Existing insti-

tutional funding mechanisms, such as NSF Science and Technology Centers, NIH P Series (Program Project Grants/Center Grants), and DOE Energy Innovation Hubs, have primarily functioned as loosely connected collaborations of principal investigators rather than unified research institutions. In contrast, X-Labs would support organizations with clear leadership, dedicated full-time teams, and visionary scientific goals.

Unlike ARPA-H and ARPA-E, which back short-term applied projects led by rotating program managers, X-Labs would fund independent research organizations with long-term missions—many focused on fundamental science, others on building critical tools and infrastructure—and the freedom to evolve their work over time, with only the most successful renewed.

Drawing inspiration from the NIH's established system of grants, including the R Series (Research Grants), K Series (Career Development), and U Series (Cooperative Agreements), the X Series would include four distinct award categories:

- **X01 (EXCELLENCE):** Breakthrough basic science institutions.
- **X02 (EXECUTION):** Focused nonprofits building critical tooling with startup-like agility.
- **X03 (EXPERIMENTATION):** Portfolio-based regranting organizations.
- **X04 (EXPLORATION):** Planning grants to test a proof of concept.

This initiative could be implemented immediately using Other Transaction Authority (OTA), allowing agencies to establish X-Labs without new legislation. Each participating agency would retain control over its own awards while coordinating within a unified X-Labs framework. Congressional appropriations could further expand the program's scale, and philanthropic matching funds could amplify its impact through public-private partnerships.

PROBLEM

For the last 75 years, US science funding has relied on project-based grants awarded to individual investigators at universities. While this model has delivered significant discoveries, it is poorly suited for research requiring large-scale infrastructure, focused interdisciplinary collaboration, or long-term investment.

However, advancing the scientific frontier increasingly depends on precisely these features. We are seeing a rise in "team science," where contributing to the frontier of knowledge in nearly every field requires larger and more specialized groups of people. In other words, the future of scientific research looks less like a lone genius working at a chalkboard and more like a team operating in a startup-like environment. For example:

EVO 2 MODEL: At the Arc Institute, researchers developed an advanced AI model trained on over 9 trillion nucleotides from 128,000 genomes across all domains of life. This model enables accurate prediction and design of genetic sequences, facilitating the identification of disease-causing mutations and the development of novel biological tools. Its development required extensive computational resources, interdisciplinary expertise in genomics and machine learning, and sustained infrastructure funding far beyond the scope of traditional NIH grants.

ALLEN BRAIN ATLAS: At the Allen Institute for Brain Science, researchers built the first comprehensive gene expression map of the mouse and human brain, creating a publicly available resource used worldwide. This required industrial-scale data collection and analysis, which would have been infeasible under the fragmented structure of traditional academic grants.

LIGHT-SHEET MICROSCOPY: At the Janelia Research Campus, scientists developed an advanced imaging technology enabling real-time, high-resolution 3D visualization of living tissues. This required multi-year engineering and computational development, which traditional NIH grants rarely support.

All of these projects succeeded because they had dedicated institutional support from philanthropic funders beyond the constraints of university-based NIH or NSF grants. Similar efforts that are publicly funded remain the exception rather than the rule, if they can get funded at all. Large-scale initiatives that succeed, like the Brain Initiative Cell Census Network, have required extensive coordination across multiple NIH institutes, with funding cobbled together from U19, U01, and R01 grants.

Meanwhile, NIH P-Series "program project" grants and the NSF's Science and Technology Centers (STCs), which nominally support large, multi-project efforts, have a variety of issues:

- They require applicants to specify in advance the exact research projects they will pursue. This rigid structure eliminates the flexibility that makes institutional block grants so effective.
- Within the university structure, these grants often function as administrative umbrellas for groups of individual Principal Investigators (PIs) and their preexisting research agenda rather than as independent organizations with clear leadership and a coherent vision.

Beyond structural funding limitations, the broader science funding system has become increasingly bureaucratic. Researchers face wait times of up to 20 months for grant funding—crippling in fast-moving fields like synthetic biology. The burden of securing funding is also enormous: scientists report spending nearly half of their time on grant-related paperwork instead of doing research. This system's preference for incremental, fundable projects over ambitious, high-risk work means that younger scientists struggle to pursue bold ideas. The average age for receiving a first NIH R01 grant is now 43, delaying career independence and discouraging risk-taking.

Some elite research universities have pioneered semi-autonomous centers and cross-disciplinary institutes that partially overcome these issues—but these are exceptions, often reliant on external philanthropy or special administrative carveouts. X-Labs would institutionalize the ability to operate with this kind of autonomy by default.

Taken together, these structural issues mean that large-scale, interdisciplinary, and infrastructure-intensive research remains chronically underfunded and organizationally constrained. Our traditional scientific funding institutions have, without a doubt, generated enormous returns for society overall and will remain essential in the future. But without a dedicated funding mechanism for independent, high-risk, team-driven research, the US risks falling behind in the next generation of scientific breakthroughs.

SOLUTION

The X-Labs Initiative

X-Labs (organizations awarded an X01, X02, or X03) would be selected through a competitive federal award program, with at least 20 institutions funded at levels of $10 million to $50 million per year, depending on their scope. Each award would run on a seven-year cycle, with a hard cap on renewals: no more than 70 percent of labs would continue into a second term. This deliberate churn would keep the portfolio dynamic—rewarding excellence while continuously making room for new entrants and fresh ideas.

To support new entrants, the program would also offer two-year "Exploration" grants (X04), providing early-stage teams with $1 million to $3 million to refine their vision and build scalable institutional plans before applying for full funding.

By providing long-term, flexible funding to institutions rather than individual projects, X-Labs would fill a structural gap in the federal research portfolio—enabling team-based science that is difficult to support through standard mechanisms—with an overall budget equivalent to roughly 1 percent of the combined NSF, NIH, and DOE science budgets.

To structure this new ecosystem, the X Series would include four distinct award types:

X01 (EXCELLENCE) AWARDS would support cutting-edge basic science institutions with flexible research environments modeled after organizations like the Janelia Research Campus, the Arc Institute, the Broad Institute, and the Allen Institute. These institutions would focus on foundational scientific discovery with stable, long-term support. The core bet behind X01s is on people, not projects—the goal is to assemble the best team in the world to pursue open-ended scientific inquiry with minimal bureaucratic constraint.

X02 (EXECUTION) AWARDS would fund scientific entities dedicated to solving critical infrastructure, tooling, or data challenges. Similar to Focused Research Organizations, these labs would be designed for time-limited, high-impact interventions and use multi-year block grants with milestone-based evaluations. Eligible institutions could include purpose-built entities working on platform technologies—such as improved instrumentation, open datasets, or scalable experimental methods—or mission-driven AI labs like early OpenAI or DeepMind, to the extent that they operate with nonprofit structures and public-interest mandates. The fundamental selection principle is the challenge: funding a talented group with a nimble organizational structure to execute against a clearly defined bottleneck in the scientific ecosystem.

X03 (EXPERIMENTATION) AWARDS would fund portfolio-based regranting and incubation organizations, acting as alternative funding institutions outside of the traditional government grant selection process, with models such as Convergent Research, Speculative Technologies, and Science Angels serving as potential inspiration. Some projects would be required to integrate metascience experiments to study and improve science-funding methodologies. The animating principle behind X03s is to empower scientific scouts: individuals or organizations with the insight, network, and conviction to identify high-potential ideas, talent, or research directions long before they become consensus picks.

X04 (EXPLORATION) AWARDS would provide seed funding of between $1 million to $3 million over a few years to support the formation and planning of new scientific institutions, enabling teams to refine their vision, build key partnerships, and develop initial proof-of-concept work before applying for full X01, X02, or X03 funding.
To ensure the success of X-Labs, the relevant agency heads should:

- Expand eligibility beyond academia, explicitly allowing and encouraging independent research organizations to apply. This shift would incentivize the creation of new models of scientific institutions and reduce dependence on traditional university structures.
- Use a deliberately selective process that prioritizes scientific vision, execution ability, and institutional leadership. Unlike traditional grant programs that must process thousands of proposals, X-Labs would evaluate a relatively small number of institutional candidates—enabling agencies to recruit elite reviewers with deep domain knowledge and judgment. While track record should matter, the process should emphasize the novelty, significance, and feasibility of the proposed scientific agenda—and whether the team has the capacity to realize it.
- Leverage OTA authority to launch X-Labs immediately while utilizing existing funding streams within the agencies, bypassing the need for specific action from Congress. Other Transaction Authority (OTA) is a flexible funding mechanism that allows agencies to sidestep traditional grant constraints. The NSF TIP Directorate and the NIH Director's Office both have access to OTA and should lead implementation within their agencies. Each agency would retain oversight of its portfolio while coordinating under a shared X-Labs framework.
- Encourage public-private partnerships with federal agencies exploring philanthropic matching funds to potentially double the impact of government investment.

Congress could expand appropriations if the model proves successful. While the initial X-Labs program would represent roughly 1 percent of total NSF, NIH, and DOE science budgets, it should be structured for scalability. If early institutions demonstrate transformative impact, Congress could authorize dedicated appropriations to grow the program, potentially to 5 or 10 times its initial size. The goal is not to constrain X-Labs to 1 percent but to establish a high-performing pilot that earns the right to scale.

JUSTIFICATION

Reducing Administrative Burden and Improving Efficiency

A key advantage of X-Labs is the ability to consolidate administrative overhead within research institutions, freeing scientists from the excessive burden of grant writing and reporting. X-Labs would centralize award administration within institutions, allowing individual researchers to specialize and focus on discovery rather than bureaucracy.

For NIH and NSF, this shift could also streamline the internal review process. Instead of evaluating hundreds of individual project-based proposals, relevant program officers could assess a portfolio of research opportunities at the institutional level. This approach could reduce workload while enabling better-informed funding deci-

sions—enabling program officers to pursue quality over quantity in the selection of peer reviewers.

While DOE already funds institutional science through its National Laboratories, the current lab system suffers from entrenched structural constraints. These labs are weighed down by inflexible governance models, antiquated procurement and HR systems, and a narrow interpretation of mission that disincentivizes scientific risk-taking. Their emphasis skews toward applied and mission-specific work, leaving limited room for curiosity-driven or exploratory research. X-Labs would provide a distinct institutional complement—supporting startup-like research organizations that are smaller, faster-moving, and less encumbered by bureaucratic or political inertia. Rather than duplicating the labs' existing role, they would offer a sharper instrument for enabling high-risk, high-reward basic science.

X-Labs would shift federal funding toward a portfolio-based approach—selecting institutions with a demonstrated capacity to manage and prioritize breakthrough science. This model acknowledges that while it is difficult to predict which specific projects would succeed, it may be easier to identify research organizations with strong leadership, a history of transformative impact, and the ability to allocate resources strategically.

Venture capital firms, for example, are evaluated based on their overall track record of investment success, not on the projected outcomes of a single investment. Similarly, X-Labs would allow agencies to renew research organizations that have shown they can generate high-impact discoveries over time, rather than attempting to predict which specific projects would succeed in isolation. ■

FURTHER RESOURCES

- Ben Reinhardt, "Fund Organizations, Not Projects: Diversifying America's Innovation Ecosystem with a Portfolio of Independent Research Organizations," Institute for Progress, January 19, 2022
- Adam Marblestone et al., "Unblock Research Bottlenecks with Non-Profit Start-Ups," *Nature*, January 11, 2022.
- Michael Nielsen and Kanjun Qiu, "A Vision of Metascience," *Scienceplusplus*, October 18, 2022.
- Ben Reinhardt, "Unbundling the University," *Speculative Technologies*, February 2025.

Caleb Watney is the co-founder and co-CEO of IFP, an innovation policy think tank. His research focuses on policy levers the US could use to rebuild state capacity and increase long-term rates of innovation.