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Realizing the American Dream for Science and AI

RFI Response Submission: Accelerating the American Scientific Enterprise in the Age of AI

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The United States created a unique formula for scientific leadership - nurturing a rich research culture as well as a vibrant entrepreneurial spirit that allowed new inventions to drive transformative impact on society and the economy. This leadership was kickstarted by significant public investments in basic science and research. But today, we have an opportunity to strengthen this legacy by building greater resiliency, robustness, and translatability across the funding ecosystem. Further, as global competition intensifies, there's a clear need to evolve traditional funding mechanisms that increasingly favor incrementalism over imagination to better support both incremental advances and breakthrough innovations that can maintain America's scientific edge.

The United States Government (USG) has an opportunity to update and strengthen its formula for global scientific leadership and stands at an inflection point where scientific discovery is no longer constrained by human intuition alone. AI-enabled research, autonomous experimentation platforms, generative models for biology, and real-time analytics have fundamentally altered what is possible at the frontier of science. To fully realize the potential of the US R&D enterprise, federal policy must modernize research infrastructure, enable high-risk/high-reward innovation, accelerate translation from laboratory to market, and ensure that the benefits of scientific progress reach all Americans.

The USG through the Genesis Mission, creates a generational opportunity to do all of this. The actions below outline concrete steps the federal government can take to address long-standing structural barriers, enhance U.S. competitiveness, and strengthen the scientific enterprise for an AI-driven era that will power the American Dream for Science. We focus on four key opportunity areas with a lens specific for biomedicine and life sciences innovation:

1. Build AI-Ready Scientific Infrastructure
2. Operate Experimental Testbeds That Bridge Across the Physical, Scientific, Policy and AI Domains
3. Maximize the Impact, Value, and ROI of Federally Funded Research
4. Accelerate Translation From Laboratory to Market

1. Build AI-Ready Scientific Infrastructure (Relevant to Questions i, ii, vi, vii, viii)

To support the next generation of research, the US government should prioritize shared, interoperable infrastructure that accelerates scientific discovery while reinforcing reproducibility, validation, transparency, transferability, and scientific integrity. AI-ready infrastructure should also address current shortcomings of the R&D Enterprise that inadvertently enhance gaps such as the "valley of death" that follows initial biomedical discovery.

We recommend:

- National reproducibility infrastructure, including platforms for experiment provenance, version-controlled data, executable workflows, and model documentation. Breakthroughs are fragile, and often represent success in the hands of a small groups of researchers in one context, not a capability that is readily productizable and scalable, which this infrastructure can address. We further recommend that the US more formally utilize FFRDCs, National Labs, UARCs as entities to help establish and maintain this infrastructure especially around key National Security topics given their historical role has been to maintain awareness of advanced technologies, USG strategies, prior state of art, and linkages to supporting communities (medical, USG labs, etc).
- Develop an "enabling resources" strategy for modular, interoperable data and systems that allow agencies, universities, and startups to plug into common standards without relying on monolithic solutions. USG strategy should also identify critical infrastructure, data sets, expertise, data collection and testing assets, etc that would support the development of solutions aligned with priority technology innovation areas. This has been done somewhat holistically in the biomanufacturing space, but other areas are more ad hoc.
- Create platforms to share negative and/or pre-competitive data that is currently inaccessible within research silos, but can accelerate science and eliminate repeated failures across the ecosystem. This further creates value for high-risk high-impact funding models where the rate of failure can be higher than traditional funding approaches, and where the richness of learnings can be significant.
- Foster a national federated learning ecosystem that can protect proprietary information while enabling overall advancement of the state of the art
- Incentivize public–private partnerships to curate, harmonize, and govern data responsibly, and can bring lessons learned to government and national labs from the private sector for best practices to curate and scale.
- Identify, protect, and invest in strategic national assets that are key to US competitiveness including DNA and RNA synthesis capabilities, advanced biomanufacturing, and GPU/compute resources.
- Leverage National Labs to provide expertise to train and upskill the broader US R&D Enterprise to leverage national assets like compute where the workforce expertise may not exist yet.

2. Operate Experimental Testbeds That Bridge Across the Physical, Scientific, Policy and AI Domains (Questions i, iii, vi, viii, ix)

Pilot programs and experimental testbeds reflect a bias for action and learning that must underpin an AI-driven scientific enterprise for the United States to allow the government to rapidly test innovative ideas in real-world settings. For biomedicine in particular, this approach can help us re-shore U.S. clinical, diagnostic, and biomanufacturing capability; upskill the next-generation workforce; assess safety and biosecurity features; assess the impact of policy and incentives before broader release, and eliminate unnecessary bureaucracy.

We recommend:

- Decentralized and accelerated clinical trial pilots, modeled after state-led efforts (e.g., Montana "Right to Try," multi-state newborn screening innovations).
- Support physical assets for validation of AI models and generation of ground truth data to advance biomedical science, including longitudinal sample biobanks that will enable AI-driven causal inference approaches that uncover root drivers of disease, not just symptoms, and create new opportunities for personalized medicine. The US lags behind countries like the UK and Singapore in establishing national-scale physical biobanks, longitudinal health datasets, and trusted data governance frameworks to better predict and mitigate disease for our population.
- AI-enabled supply chain testbeds for diagnostics, biologics, and therapeutics, with support of NIST and organizations like US Pharmacopeia to accelerate validation of re-shored US supply chain as it comes online.
- National testbeds for benchmarking AI models, AI scientists, biosecurity measures, lab automation platforms, and biological workflows—improving robustness and strengthening U.S. leadership. These testbeds would help set expectations for a robust and reproducible scientific enterprise, and lower barriers to integrate across systems and markets.

Further, we recommend to focus national energy, pilots should align around specific, unifying missions across sectors, for example:

- Patient access to data: Remove regulatory and technical barriers preventing patients from accessing their health data within 24-hours, with incentives for high-performing providers and accelerated pathways for systems demonstrating seamless data portability..
- Explore opportunities streamline IND submission processes by enabling parallel rather than sequential workflows, while maintaining safety standards and reducing administrative barriers for first-in-human studies.
- Consider enhanced reimbursement mechanisms for Phase 2 trials in areas of high unmet medical need to support therapeutic development.
- Support the development of risk-appropriate manufacturing standards for early-phase trials, especially in personalized medicine and rare disease, that maintain while reducing unnecessary barriers to innovation.

3. Maximize the Impact, Value, and ROI of Federally Funded Research (Questions ii, v, vi, vii, xii)

The American scientific enterprise should encourage more high-risk, high-reward research that could transform our scientific understanding and unlock new technologies, in a manner that is unwavering in scientific excellence, entrepreneurship, and American ingenuity. Further, while sustaining the incremental science essential for cumulative production of knowledge, the US must better capitalize on the data that is locked in silos across the ecosystem and ensure that US funded research broadly enhances the US scientific enterprise through the open and robust sharing of data and transparency into the investments made by the USG.

We recommend:

- Incentivize and Enforce Data Sharing and Collaboration Across Sectors by requiring grant applicants to include reproducibility and validation strategies (similar to data management

plans) that outline how results, code, and data (from both successes and failures) will be made verifiable. Make compliance with data deposition requirements a prerequisite for future federal grant awards.
- Require agencies to set aside a percentage of program budgets for demonstration of reproducibility, and payments upon go/no-go milestones linked to reproducibility and transferability to improve downstream reliability without slowing innovation.
- Exploring opportunities to provide non-financial incentives to accelerate research that bring unique value to the research community including alignment of regulatory incentives to reward reproducible, transparent, and translatable R&D practices. Agencies (e.g., FDA, EPA, USDA) could provide expedited review pathways, priority designations, or other regulatory advantages to performers who demonstrate robust reproducibility practices, transparent documentation, and pre-competitive access to underlying data—including negative data.
- Create a Public Research Registry for all R&D to make private funders aware of federally-funded research. NIH RePORTER comes close to achieving this already, though semantic search would help private industry find relevant projects. Generally, greater transparency of government grant deliverables would facilitate Gold Standard Science.

4. Accelerate Translation From Laboratory to Market (Primary for Question ii; also i, iv, vii)

The USG plays a critical role to support high-risk high-payoff research, yet there remains a need to modernize technology transfer and transition to adequately support a translational science ecosystem to further de-risk downstream investment and advanced development to accelerate the dissemination of knowledge and technologies to the American people, and support a robust economy based on breakthrough innovation. Actions are required to strengthen the handoff between basic research and commercial readiness, reducing risk for later-stage investors and accelerating productization.

We recommend:

- Supporting a “GitHub for executable science” to store code, workflows, and negative data—reducing wasted effort and improving replicability.
- Establish a dedicated Translational Science Fund to support independent validation, context-transfer studies, and reproducible pipeline development.
- Create a National Marketplace for Translational Science that can complement the Public Research Registry for all R&D that provides database of all outcomes, IP, licensing opportunities, etc for science and technology that has resulted from US R&D investment, making more transparent to the private sector and advanced developers assets available for productization, commercialization, and acquisition. Supporting this capability can also be standardized templates for technology readiness assessments, predictable de-risking pathways for emerging technologies, and co-development incentives and advance market commitments for priority disease or mission areas.

Conclusion

The actions recommended here position the United States to outpace global competitors and lead the 21st-century scientific enterprise. By modernizing infrastructure, accelerating translation, enabling regulatory innovation, structuring effective public–private handoffs, and preparing institutions for an AI-driven era, the federal government can catalyze a new generation of breakthroughs that improve lives, strengthen economic resilience, and maintain American leadership and strengthen national resilience for decades to come.

About General Catalyst Institute: The General Catalyst Institute (GCI) launched in September 2024 to partner with government leaders around the globe to promote resilience by backing transformative technologies and shaping public policy that advances our societal impact. GCI is part of General Catalyst, a global investment and transformation company that partners with leading entrepreneurs to build toward global resiliency and applied AI.

About Transfyr: At Transfyr (transfyr.ai), we are building the AI-driven infrastructure to enable the exchange of scientific know-how between individuals and organizations, just as APIs create interfaces for software systems to seamlessly integrate. We build advanced multimodal and self-evolving AI tools to wrestle with the complex physical realities of science, enabling scientists to fully capture and translate what it really takes to move science beyond the lab. We are a seed stage company, backed by deep technology investors including General Catalyst.