**Re: OSTP-TECH-2025-0100 — Request for Information on Accelerating the American Scientific Enterprise**

On behalf of our constituents, we appreciate the opportunity to comment on the Office of Science and Technology Policy's Request for Information. SPIE, the international society for optics and photonics, represents researchers, engineers, students, and industry partners across the optics and photonics community. Optical and photonic technologies underpin critical capabilities across semiconductors, quantum information science, biomedical imaging, national defense, advanced manufacturing, and communications. As a field that spans fundamental physics through high-value commercialization, our community offers the following recommendations in response to OSTP's questions.

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**(i) Strengthening Public–Private Collaboration**

Stronger public–private partnerships are essential to accelerate use-inspired optics and photonics research. The National Academies' report *Open Science by Design* (2018) notes that access to shared research infrastructure is one of the most effective mechanisms for bridging academic–industry boundaries. Similarly, the 2022 CHIPS for America Strategy emphasizes the importance of flexible cooperative agreements and shared facilities to advance semiconductor and photonics manufacturing.

We support expanding:

- **Cooperative agreements and Other Transaction Authority (OTA)** programs, following the successful ARPA–E and DARPA models.
- **Multi-agency photonics programs**, modeled on Manufacturing USA institutes, consistent with the recommendations of the NASEM report *Harnessing Light III* (2021).
- **Predictable multi-year support for shared-use facilities**, which has been demonstrated in NSF's mid-scale infrastructure program.
- Increase access to fabrication and prototyping resources, including foundry access to photonic integrated circuit (PIC) fabrication that supports advances in quantum, communications, and healthcare technology, to bridge the "valley of death."

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**(ii) Accelerating Translation and Technology Transfer**

To move research from the lab to the marketplace more effectively:

- **Modernize technology transfer policies** to allow more flexible licensing, especially for platform technologies such as lasers, detectors, and integrated photonics.
- **Expanded translational programs** at NSF TIP, DOE, and DOD, following evidence from NIST's ROI Initiative (2019) on the value of streamlined tech transfer.

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**(iii) Regional Innovation Ecosystems**

Place-based innovation that gains from the network benefits of interconnected expertise has strong empirical support.

We recommend:

- Continuing to support and grow **NSF's Regional Innovation Engines and EDA Tech Hubs** programs that target investments to accelerate regional R&D capacity.
- **Support for technician training programs** to bolster the workforce pipeline in these key regions.

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**(iv) Empowering Small and Medium-Sized Businesses**

Nearly 90% of U.S. photonics companies are small or medium-sized enterprises (SPIE Industry Report, 2023). These firms face disproportionate compliance and procurement burdens.

OSTP can strengthen their role by:

- **Supporting continuation of the SBIR/STTR programs**, though Congress is the one that needs to act to provide legislative authority to continue these programs, we urge that the Administration do everything possible to facilitate a compromise that provides a path to reauthorization.
- **Streamlining cyber and reporting requirements**, while maintaining security (NIST SP 800-171). As cyber-attacks become more targeted and prevalent, stronger security is needed, though small and medium enterprises often lack the skill or resources to mount adequate defenses. Clarifying requirements, reducing reporting redundancy, and providing expert support can help organizations better prepare defenses.

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**(vi) Enabling High-Risk, High-Reward Research**

NASEM's *Rising Above the Gathering Storm* (2007) and NIH's *High-Risk, High-Reward Research Program* (2019) emphasize the necessity of long-term, ambitious funding. Public R&D funding has been definitively shown to drive innovation that results in increased productivity, economic growth, and improved quality of life. Because photonics serves as an enabling technology, advances in this field create significant leverage across the technology landscape and US economy.

We recommend:

- **Increased investment in photonics R&D** that accelerates the advancement of this enabling technology, including academic funding that provides the training required to support the next generation of innovators, to seed economic growth and ensure technological prowess.
- ARPA**-style photonics research programs** targeting enabling technologies such as ultra-high-power lasers, novel sources and wavelengths, advanced materials, communications, next-generation imaging, emergent computation and AI processing hardware, photonic integrated circuits, and quantum photonics.
- **Expand and deepen interagency coordination** in critical technology areas like quantum science, space science, biomedical imaging, and semiconductor manufacturing.

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**(vii) Supporting Novel Research Institutions**

Focused Research Organizations (FROs) have been identified as promising in The Entrepreneurs Network's 2022 brief titled "*New Models for Science"*. For optics and photonics, FROs are especially suited to:

- **Large-scale optical and photonic metrology projects** that can develop foundation measurement standards and methods, from which innovation can flourish.
- Photonics manufacturing and testbeds that can accelerate the transition from research to commercial products.
- Long-term instrument development (e.g., telescopes, quantum networks).

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**(viii) Preparing for Advances in AI-Enabled Science**

AI-enabled experimentation is rapidly maturing. The 2023 OSTP *National AI R&D Strategic Plan* calls for AI-integrated scientific infrastructure and workforce development.

Key needs include:

- **Standardized datasets** for optical imaging and sensing, consistent with NIST AI data quality guidelines (NIST SP 1270) that provide ground-truth and can support development of accurate models.
- **AI-ready lab automation and data standards**, as highlighted in NSF's 2024 DCL on AI-ready Test Beds, which can enhance productivity and speed discovery.

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**(ix) Removing Barriers to Research and Deployment**

Several existing policies hinder progress:

- **Export controls and overly broad classification** of optics and photonics components can limit legitimate research collaboration and company growth. Targeted refinement and clear classification with appropriately narrow restrictions is needed to support innovation while protecting national security.
    - A prime example of this are current controls on uncooled infrared sensors and focal plane arrays. At lower resolutions (below 640 x 512), the technology is widely available beyond Wassenaar countries and yet US DoD still insists it needs to be restricted. This has driven manufacturers offshore and along with it, the R&D that inspires more cutting-edge versions of this technology.
- **Outdated procurement rules** hinder adoption of cutting-edge optical and photonics technologies within Federal agencies. These regulations are particularly unsuited for high-technology procurement, especially for novel technologies and for high-risk/high-reward procurements.
- **Visa and immigration delays** impact the flow of scientific talent critical to U.S. leadership, and drive needed capacity for discovery and innovation elsewhere. It is estimated that American employers will need 4.5 million additional workers with bachelor's degrees or higher by 2032, with critical needs in national priorities including semiconductors and quantum technology. Domestic education cannot fully meet the projected demand.

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**(x) Identifying and Developing Talent Nationwide**

The U.S. is falling behind global competitors in STEM graduation output and faces severe STEM workforce shortages. This requires increasing the STEM pipeline and educational capacity. Distributed research models—such as remote-access experimental tools—have been shown effective in DOE light-source user facility data (Berkeley Lab, Annual Reports 2018–2023). OSTP can improve national reach by:

- **Supporting public school science education** to expand the pipeline of potential technology workers and increase public understanding of science and technology needed for an increasingly technological world.
- **Increasing STEM capacity and support in universities** to help close this education gap.
- **Expanding undergraduate and community college pathways**, consistent with NASEM's technician workforce recommendations.
- **Increasing the availability of fellowships for researchers**, both within R1 institutions and beyond (in alignment with NSF EPSCoR evidence on talent distribution) to maximize opportunity and expand the next-generation pool of technology workers.
- **Supporting remote participation in major facilities** to increase access to opportunities.

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**(xii) Ensuring Equitable Public Benefit**

Federal research investments must yield nationwide benefits. Optics technologies—such as fiber broadband, medical imaging, and lidar—directly advance public health, safety and economic opportunity. NASEM's *Optics and Photonics: Essential Technologies for Our Nation* (2013) documents these impacts extensively.

We recommend:

- **Open science and data policies**, consistent with the 2022 OSTP Public Access Memo.
- SPIE has a long commitment to Green Open Access and membership in CHORUS (Clearinghouse for the Open Research of the United States) which supports the responsible sharing of research data and scientific discovery as outlined in the OSTP memorandum from August 25, 2022 (the "Nelson Memo"). We recognize that

broader access to federally funded research can accelerate U.S. scientific progress and enhance interdisciplinary engagement and innovation. At the same time, our experience shows that open access adoption varies by community, and broad policies can undermine certain technical communities and discourage innovation. It is also expensive to publish correct and trustworthy research. This underscores the importance of flexible and sustainable approaches that respect disciplinary differences and cover the costs of scrutiny and scientific rigor, while advancing open science goals. SPIE is committed to working with stakeholders to implement policies that balance open science with the operational realities of responsible scholarly publishing. Accordingly, policies should provide sustainable business models for non-profit societies that support peer-review and scholarly publishing as part of their service.

- **STEM outreach and teacher training**, particularly in rural and underserved areas.

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**(xiii) Strengthening Research Security With Minimal Burden**

NASEM's *Protecting U.S. Technological Advantage* (2022) stresses the need for clear, predictable research security rules. Compliance that strengthens research security is best obtained through clarity and uniformity.

We recommend:

- **Harmonized Federal guidelines**, reducing duplicative reporting and inconsistent guidelines. Controls should be searchable though a single consolidated database that combines agency requirements to facilitate initial identification of requirements.
- **Precise definition of controlled technologies**, particularly in advanced and fast-moving fields like photonics. Ambiguity can lead to unintended negative consequences, such as overly conservative interpretations that unnecessarily restrict information or lead to undesirable decisions that slow or thwart activity.
- **Centralized training resources** for institutions lacking compliance capacity.

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**Conclusion**

Optics and photonics have proven to be foundational to U.S. scientific and technological leadership. This field of science continues to enable major advances in research, development, manufacturing and services with substantial economic and public benefit.

We appreciate OSTP's commitment to strengthening the national science and technology enterprise and welcome further dialogue to ensure that Federal policy supports innovation, security, and equitable benefit for all Americans.