FASEB
FEDERATION OF AMERICAN SOCIETIES FOR EXPERIMENTAL BIOLOGY

REPRESENTING OVER 100,000 RESEARCHERS
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Submitted electronically via the [Comment Form: Measuring and Rewarding Scientific Impact - Office of Science Policy]

The Honorable Jayanta Bhattacharya, M.D., Ph.D.
Director, National Institutes of Health
9000 Rockville Pike
Bethesda, MD 20892

Re: Comments of the Federation of American Societies for Experimental Biology (FASEB) on the National Institutes of Health Request for Information (NOT-OD-26-087), *Measuring and Rewarding Scientific Impact*

Dear Director Bhattacharya:

The Federation of American Societies for Experimental Biology (FASEB) appreciates the opportunity to respond to the National Institutes of Health (NIH) Request for Information (NOT-OD-26-087), M*easuring and Rewarding Scientific Impact*. Representing 21 American scientific societies and more than 100,000 researchers across the biological and biomedical sciences, FASEB commends NIH's efforts to develop approaches that more fully recognize the full range of contributions that advance biological and biomedical research while maintaining the highest standards of scientific rigor and public trust.

FASEB's member societies steward critical components of the biological and biomedical research enterprise by publishing peer-reviewed journals, convening scientific meetings, and providing mentoring and career development programs that help ensure federally funded discoveries are rigorously evaluated, disseminated, and built upon by the broader research community, including industry. FASEB approaches this RFI both as a representative of individual investigators and as a steward of the infrastructure that translates NIH-funded research into scientific and public value, consistent with the principles of Executive Order 14303, *Restoring Gold Standard Science* (May 23, 2025). FASEB believes that rigorous, expert peer review remains the cornerstone of evaluating scientific quality, maintaining the credibility of science, and ensuring responsible stewardship of federal research investments.

NIH's reporting and evaluation frameworks represent only one component of the broader research assessment ecosystem. Many meaningful indicators of scientific quality, rigor, and impact already exist but are not consistently recognized or incorporated into evaluation processes. These indicators should complement—not replace—expert scientific peer review, which remains the most effective mechanism for evaluating rigor, originality, significance, and

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scientific quality in both funding decisions and scholarly publication. Peer-reviewed publications remain an essential indicator of scientific productivity; however, publication counts alone do not capture the full value of a scientist's contributions. Notably, even journals evaluate their own performance using a portfolio of complementary metrics rather than publication volume alone.

FASEB encourages NIH to partner with scientific societies, research institutions, and other stakeholders to modernize research assessment in ways that are evidence-based, practical, and appropriate across disciplines, career stages, institution types, and resource levels. FASEB stands ready to support NIH by identifying meaningful scientific impact indicators and assessment approaches, evaluating implementation strategies, and helping minimize unnecessary administrative burden, particularly for smaller and less-resourced institutions.

Topic 1: Rigor and Reproducibility

FASEB recommends NIH:

Establish clear definitions of reproducibility and causal research before incorporating them into scientific impact assessment. NIH should clearly define these concepts and communicate consistent expectations before incorporating them into evaluation or reporting. Scientific societies can help ensure these definitions are interpreted consistently across disciplines and implemented equitably.

Complement traditional productivity measures with evidence of rigorous scientific practice. Where measurable indicators are appropriate, NIH should emphasize established practices that support rigor, including authentication of key biological and chemical resources, adherence to community reporting standards, appropriate preregistration of confirmatory studies, and successful independent validation. These indicators provide an additional layer of value and understanding of the incentive structure at institutions.

Integrate transparency for generative AI into existing reproducibility policies. As AI becomes increasingly integrated into biological and biomedical research, NIH should incorporate documentation of AI tools, such as the model, provider, and version where appropriate, within existing authentication and reporting requirements rather than creating separate reporting systems. Building on NIH's existing *Enhancing Reproducibility through Rigor and Transparency* guidance (NIH, 2025), this approach will promote transparency, support computational reproducibility, and minimize additional administrative burden while allowing expectations to evolve alongside advances in AI.

Invest in infrastructure that enables rigorous science. Reproducibility depends on sustained access to shared research resources, core facilities, modern instrumentation, and skilled technical staff. NIH should ensure that investments in reproducibility are matched by investments in the infrastructure needed to support them; otherwise, expectations for rigor may outpace institutional capacity.

Recognize replication as a valuable scientific contribution. Independent replication strengthens confidence in scientific findings but remains underrecognized within traditional systems of academic reward. NIH should recognize replication studies as distinct scholarly contributions within existing reporting mechanisms and continue developing funding opportunities that support high-priority replication efforts. To foster this commitment to replication, today, many societies have at least one journal in their portfolio that allows for recognition of and publication of replication studies, and several societies have supported the community further by dedicating special issues to replication studies.

Support scientific societies as critical to the research ecosystem as they seek to advance reproducibility. Biological and biomedical scientific societies are uniquely positioned to develop discipline-specific standards, identify high-priority opportunities for replication, disseminate best practices, and provide training in rigorous and reproducible research methods. NIH should continue to support society-led initiatives, including the development of training resources and the integration of rigor and reproducibility modules into programs serving researchers across career stages, including predoctoral trainees, postdoctoral researchers, and early-career investigators.

Scientific impact cannot be meaningfully assessed without confidence in the quality and reliability of the underlying science. FASEB encourages NIH to build its scientific impact framework on the foundation of rigorous, expert peer review, which remains the cornerstone of research assessment and the credibility of science. Responsible indicators of rigor should supplement, not substitute for, expert scientific judgment and should be implemented in partnership with the scientific community, consistent with the principles of Executive Order 14303, *Restoring Gold Standard Science*.

Topic 2: Data, Software, and Model Sharing

Peer-reviewed publications remain the primary scholarly output of biological and biomedical research and an essential means of communicating scientific discoveries. The value of biological and biomedical research, however, also extends to data, software, computational models, and other enduring research outputs that enable validation, reuse, and new lines of investigation. NIH has made considerable progress through its *Data Management and Sharing Policy* (NIH, 2023). Building on this progress, NIH should recognize and reward the creation, stewardship, and sharing of high-quality research resources to maximize the return on the nation's investment in biological and biomedical research.

FASEB recommends NIH:

Recognize data, software, and computational models as additional scholarly products alongside publications. These outputs should be evaluated in addition to publications in funding decisions and progress reporting. NIH should continue incorporating these contributions into existing investigator reporting mechanisms, including the Biographical Sketch Common Form and Contributions to Science, so that researchers receive appropriate credit for developing resources that enable discovery across the biological and biomedical enterprise.

Reward quality, reuse, and interoperability. The value of shared research resources lies in their accessibility, reliability, interoperability, and scientific utility, not simply whether they are deposited. Assessment systems that prioritize quantity over quality, usability, or scientific value risk encouraging compliance-driven behavior without meaningfully advancing research. Where measurable indicators are appropriate, NIH should emphasize adherence to the FAIR Principles (Wilkinson et al., 2016), documented reuse, appropriate citation, interoperability, and downstream scientific impact. Consistent with FASEB's longstanding position on data management and access, incentives should encourage the sharing of high-value research resources while avoiding requirements that create unnecessary administrative burden with limited scientific benefit.

Recognize stewardship as a valuable contribution. Long-term stewardship of datasets, software, repositories, and other shared research resources requires sustained scientific expertise. NIH should recognize activities such as curation, quality control, documentation, and long-term maintenance as distinct, valuable contributions within investigator assessment. Recognizing stewardship will encourage sustained investment in high-quality research resources that remain reliable, reusable, and valuable over time.

Invest in the infrastructure that enables responsible sharing and long-term stewardship of research resources. Expectations for sharing data, software, biospecimens, model organisms, reagents, and other valuable research resources should be matched by sustained investments in repositories, biobanks, research resource centers, core infrastructure, cloud resources, metadata standards, and the skilled technical workforce required to curate and maintain them. Without this support, valuable scientific resources may become inaccessible, limiting reproducibility, reducing reuse, and diminishing the long-term return on NIH's investment. Long-term stewardship of these resources should not depend solely on individual research grants.

Promote transparency and reproducibility for computational models. As artificial intelligence and computational modeling become increasingly integrated into biological and biomedical research, NIH should encourage transparent documentation of model provenance, versioning, computational workflows, and other information needed to support reproducibility, as appropriate. Building these expectations into existing reporting practices will improve transparency, strengthen confidence in AI-enabled research, and allow guidance to evolve alongside advances in computational science.

Providing funding for, and rewarding, the creation and stewardship of the comprehensive knowledge ecosystem, including peer-reviewed publications, data, software, and computational models, is essential to maximizing the return on the nation's investment in research.

Topic 3: Training and Mentoring

NIH's mission depends on a strong, sustainable biological and biomedical research workforce, and mentorship is among the most important contributions scientists make to that workforce. Yet mentorship remains largely invisible in traditional measures of scientific productivity and impact. As a federation of scientific societies, FASEB has extensive experience advancing research skill development, mentorship, and workforce development through NIH-funded programs, scientific society initiatives, and evidence-based policy recommendations. Drawing on this experience, FASEB encourages NIH to recognize mentorship as a valuable contribution, reward high-quality training environments, and adopt assessment approaches that reflect the various career pathways essential to the biological and biomedical research enterprise.

FASEB recommends NIH:

Recognize mentorship as a valuable contribution. Effective mentorship should be recognized alongside scientific achievement in NIH assessment and reporting. Building on recommendations from the NIH Advisory Committee to the Director Working Group on Re-envisioning NIH-Supported Postdoctoral Training (NIH ACD, 2023), NIH should incorporate structured documentation of mentoring activities, mentor development, and scholar outcomes into relevant existing reporting mechanisms. Assessment should emphasize mentoring quality and scholar success rather than simply the number of scholars supervised, while recognizing participation in evidence-based mentor training as an indicator of scientific leadership.

Leverage existing NIH training programs rather than creating new assessment systems. Institutional training grants, particularly T32 programs, represent NIH's most established framework for evaluating research training because they already incorporate structured training plans, mentor oversight, career development activities, and longitudinal scholar outcome reporting. NIH should build on these established mechanisms to identify effective mentoring practices, evaluate training environments, and disseminate evidence-based approaches while minimizing additional administrative burden.

Evaluate training through meaningful scholar outcomes that recognize various career pathways. NIH should recognize successful career outcomes across academia, industry, government, nonprofit organizations, education, and other sectors. Building on existing trainee outcome reporting and standardized career taxonomies such as Unified Career Outcomes

Taxonomy (UCOT; Stayart et al., 2020), indicators including degree completion, career transitions, K99-to-R00 transition, K-to-R conversion, and time to research independence can provide meaningful measures of program effectiveness when interpreted within program context.

Recognize competency-based development as an indicator of quality. Effective research training develops competencies in scientific rigor, leadership, communication, professionalism, responsible conduct of research, and career development. NIH should encourage competency-based assessment that complements traditional research outputs while remaining flexible across career stages and career pathways.

Support mentoring networks that reflect today's biological and biomedical workforce. Scientists increasingly benefit from mentoring networks that include research, career, peer, and cross-sector mentors. NIH should recognize and encourage distributed mentoring models that strengthen career development, broaden access to expertise, and better reflect the collaborative nature of today's biological and biomedical research enterprise.

Recognize the complementary role of scientific societies in workforce development. Scientific societies provide mentoring, leadership development, networking, career exploration, and professional communities that complement institutional training. These activities expand access to expertise, strengthen professional networks, and complement institutional training across career stages. NIH should continue partnering with scientific societies to extend the reach and impact of its workforce development investments.

Mentorship is among the most consequential—and least recognized—contributions scientists make to the biological and biomedical research enterprise. Assessment approaches should support long-term program improvement rather than short-term funding decisions and account for institutional context, discipline, career stage, and the time required for meaningful career outcomes to emerge. By recognizing mentoring excellence and high-quality training environments, NIH can strengthen the biological and biomedical workforce and, in turn, the nation's innovation economy.

Topic 4: Collaboration

Collaboration has become a defining feature of modern biological and biomedical research, with discoveries increasingly emerging from multidisciplinary teams that span institutions, sectors, and scientific disciplines. Through its member societies, scientific meetings, and collaborative initiatives, FASEB has long supported team science and interdisciplinary collaboration. As NIH develops approaches for recognizing and assessing scientific impact, assessment should recognize the range of scientific contributions that enable collaborative research while remaining appropriate across disciplines, career stages, and research settings.

FASEB recommends NIH:

Recognize the full range of scientific contributions that enable team science. Scientific impact should not be inferred solely from a singular metric; a matrix approach is recommended. Rigorous peer review should continue evaluating the quality of collaborative science, while structured contribution taxonomies such as the Contributor Roles Taxonomy (CRediT) developed by the National Information Standards Organization (NISO) provide additional context regarding individual contributions. NIH should incorporate these taxonomies into existing reporting mechanisms to provide additional context regarding individual contributions.

Evaluate collaboration based on scientific contributions rather than team size. Assessment should recognize interdisciplinary integration, shared leadership, effective coordination among collaborators, and the scientific advances enabled by collaboration rather than relying on coauthor counts or other quantitative measures.

Recognize cross-sector collaboration as an indicator of valuable impact. Biological and biomedical discovery increasingly depends on partnerships among academia, industry, government, healthcare systems, nonprofit organizations, patient communities, and scientific societies. NIH should recognize collaborations that meaningfully advance scientific discovery, translation, workforce development, or public health.

Recognize collaborative leadership within NIH assessment and reporting. NIH should continue recognizing multiple principal investigators, co-investigators, and other collaborative leadership roles within its funding and research assessment processes, reinforcing institutional recognition of team-based science.

Ensure collaborative science supports early-career investigators. Assessment approaches should enable students, postdoctoral scholars, and early-stage investigators to clearly document their individual scientific contributions within collaborative projects. Participation in team science should provide opportunities to demonstrate scientific independence rather than obscure individual contributions.

Avoid metrics that create unintended incentives. Measures based solely on coauthor counts, collaboration team size, or other quantitative proxies are poor indicators of meaningful collaboration and may encourage honorary authorship or unnecessary expansion of research teams. Collaboration should instead be evaluated based on documented scientific contributions, the quality and impact of the collaborative work, and disciplinary norms.

Scientific progress increasingly depends on effective collaboration across disciplines, institutions, and sectors. By recognizing meaningful contributions to team science, NIH can strengthen collaborative innovation while ensuring assessment remains equitable, transparent, and reflective of modern biological and biomedical research.

Topic 5: Entrepreneurship and Translation

Biological and biomedical research creates value by generating new knowledge and translating discoveries into improved health. Successful translation depends on sustained investment in investigator-initiated foundational research together with effective cross-sector partnerships. Through their peer-reviewed journals, scientific meetings, and professional networks, FASEB's member societies help advance discoveries from the laboratory to practical application. As NIH develops approaches for recognizing scientific impact, entrepreneurial and translational activities should be recognized as important scientific contributions without diminishing the vital importance of foundational discovery research.

FASEB recommends NIH:

Recognize translational research as a valuable scientific contribution. NIH should recognize contributions that advance discoveries toward clinical practice, public health, diagnostics, therapeutics, medical technologies, and other real-world applications. Assessment should recognize progress across the translational continuum, including advancement through the research and development pipeline and the maturation of early-stage discoveries, rather than focusing solely on commercial endpoints.

Recognize entrepreneurial and innovation activities that responsibly advance biological and biomedical discoveries. Activities such as technology development, invention disclosure, patenting, licensing, startup formation, and regulatory advancement can represent meaningful scientific contributions when they advance the translation of NIH-supported discoveries into products, services, and technologies that improve health. Recognizing these activities within existing reporting mechanisms will encourage investigators to pursue translational research while preserving support for foundational discovery. Because commercialization infrastructure, including technology transfer offices, industry partnerships, and access to capital, is unevenly distributed, NIH should avoid indicators that disadvantage investigators at smaller or less-resourced institutions or reward patenting activity without evidence of meaningful translational or public benefit.

Recognize the role of the Bayh-Dole framework in moving federally funded discoveries toward public benefit. For more than four decades, the Bayh-Dole Act has enabled discoveries made with federal support to advance toward application through invention disclosure, patenting, and licensing, catalyzing the development of new drugs, diagnostics, and medical technologies. NIH's assessment framework should reinforce the successful incentives established under the

Bayh-Dole Act by recognizing technology transfer, patenting, licensing, and related translational activities as legitimate scientific contributions while continuing to value the foundational research on which these activities depend.

Support cross-sector partnerships that accelerate bench-to-bedside translation. Successful translation depends on collaboration among academic institutions, industry, government agencies, healthcare systems, patient organizations, philanthropies, and scientific societies. NIH should recognize meaningful partnerships that move discoveries toward application and improve public health, while ensuring that individual investigator contributions within these partnerships remain visible in assessment.

Evaluate translation using meaningful evidence of scientific advancement. Assessment should emphasize evidence that discoveries are progressing toward application, including adoption of new methods or technologies, advancement through the development pipeline, and incorporation into clinical practice or public health. Quantitative measures should be interpreted within the context of discipline, career stage, and the long timelines, often a decade or more for new therapeutics, that translation frequently requires, so that early-career researchers are not disadvantaged when translational outcomes fall outside their typical evaluation windows.

Translation is one of the principal ways biological and biomedical research delivers benefits to patients and society, but it depends on sustained investments in rigorous, peer-reviewed basic research. By recognizing entrepreneurship and translation as complementary dimensions of scientific impact and continuing to support the Bayh-Dole framework, NIH can strengthen the continuum from discovery to application while preserving incentives for foundational science.

Topic 6: Foundational Scientific Exploration

Foundational scientific exploration is the wellspring of biological and biomedical progress. The discoveries that ultimately transform human health frequently originate in curiosity-driven investigation whose applications cannot be foreseen at the outset and may take years or decades to emerge. Sustained progress in translational and clinical research depends on a continuous supply of the new knowledge, mechanisms, and targets that fundamental research generates. As NIH develops approaches to measuring scientific impact, FASEB encourages the agency to also recognize, protect, and reward foundational biological and biomedical exploration, recognizing that assessment systems built solely around near-term or easily quantified outcomes risk undervaluing the basic science on which future advances depend.

FASEB recommends NIH:

Protect foundational research from assessment systems that favor near-term outcomes. Because the impact of basic biological and biomedical science often emerges years or decades later through unpredictable pathways, NIH should adopt approaches to evaluation that account for the long and uncertain timelines of discovery research.

Recognize the advancement of fundamental knowledge as a core indicator of scientific impact. Expanding our understanding of biological systems, including fundamental cell, molecular, and organismal biology and the discovery of new biological concepts and therapeutic targets, is a foundational contribution to the biological and biomedical research enterprise, independent of near-term application. NIH should recognize contributions that advance fundamental knowledge, generate new concepts and tools, or open new lines of inquiry as meaningful indicators of impact within existing evaluation and reporting mechanisms.

Support high-risk, high-reward research through appropriate assessment. Transformative discovery often depends on investigations that carry significant uncertainty and may not yield the anticipated result. NIH should ensure that assessment approaches do not penalize scientifically rigorous research that does not produce the anticipated findings and should recognize well-executed negative or null results as meaningful contributions to scientific knowledge.

Account for long and unpredictable timelines in evaluating foundational research. Measures tied to short reporting windows cannot capture the trajectory of basic science. NIH should favor evaluation approaches that accommodate extended timeframes, avoid drawing conclusions about impact prematurely, and allow the significance of foundational biological and biomedical discoveries to emerge over time. Because foundational discovery is inherently unpredictable, impact assessment frameworks should continue to support a diverse portfolio of investigator-initiated, curiosity-driven research rather than directing resources primarily toward predefined priorities or readily measurable near-term outcomes.

Foundational biological and biomedical science exploration is the source of discoveries that ultimately transform health, yet its value is the hardest to capture through conventional measures of impact. FASEB urges NIH to design assessment approaches that recognize, protect, and reward curiosity-driven science, thereby safeguarding the discovery research from which tomorrow's advances will arise.

Topic 7: Public Impact

Biological and biomedical research generates value through publications, datasets, software, computational models, and other enduring scientific outputs. It also delivers value in improving health, strengthening the economy, informing clinical practice, building public trust, and benefiting society in ways that often emerge over many years. As NIH develops approaches to assess public impact, FASEB encourages the agency to recognize the many pathways through which research benefits the public. Public impact is multidimensional and should be assessed through a matrix of complementary indicators that reflect NIH's mission.

FASEB recommends NIH:
Recognize improvements in health and clinical practice as core indicators of public impact. NIH should also recognize contributions that improve health outcomes, inform clinical care, support implementation of evidence-based interventions, and broaden access to effective care, including the responsible return of research results where appropriate.

Incorporate validated measures of economic and societal benefit. NIH-supported research drives innovation, economic growth ($2.57 for each $1.00 invested), workforce development, and national competitiveness. Where appropriate, NIH should also incorporate validated measures of economic impact alongside other metrics to better communicate the broad public return on federal investment in biological and biomedical research.

Recognize public engagement and trustworthy science communication as scientific contributions. Building and maintaining public trust requires sustained engagement with patients, communities, educators, policymakers, and the public. NIH should also recognize meaningful contributions to science communication, patient and community engagement, transparency, and other activities that strengthen confidence in biological and biomedical research. Scientific societies are important partners in developing and disseminating evidence-based communication practices and fostering public trust.

Avoid simplistic measures of public impact. No single metric can adequately capture the many ways biological and biomedical research benefits society, and a matrix of indicators is warranted. Likewise, economic measures should complement, not replace, assessment of health outcomes and broader public benefit. NIH should instead adopt a balanced framework that recognizes health outcomes, clinical practice, economic growth, accessibility, public trust, and societal benefit as complementary dimensions of impact.

Recognize public impact within existing application, reporting, and research assessment processes. Investigators should be able to document meaningful public impacts, including contributions to clinical guidelines, public policy, accessibility, community engagement, the responsible return of research results, and public understanding of science. Narrative descriptions should complement quantitative indicators by capturing important additional impacts.

Partner with scientific societies to strengthen public engagement and scientific literacy. Scientific societies play an essential role in communicating biological and biomedical scientific advances, convening experts, engaging communities across the country, and developing trusted educational resources. NIH should continue partnering with scientific societies to strengthen public understanding of biological and biomedical research and ensure that measures of public impact reflect the range of disciplines and communities they serve.

Public impact is the ultimate expression of NIH's mission. FASEB encourages NIH to adopt assessment approaches that recognize the various ways biological and biomedical research improves lives by valuing publications alongside datasets, software, computational models, and other scientific contributions, while remaining flexible, evidence-based, and appropriate across scientific disciplines and stages of research.

In conclusion, FASEB supports NIH's efforts to develop a more comprehensive approach to measuring and rewarding scientific impact that recognizes the full range of contributions advancing biological and biomedical research. ***As NIH develops this framework, we encourage the agency to preserve rigorous, expert peer review as the foundation for evaluating scientific quality while adopting responsible, evidence-based indicators that complement—not replace—scientific judg*****ment**.

FASEB urges NIH to adopt the recommendations outlined above to ensure that scientific impact is assessed in ways that strengthen rigor, encourage innovation, recognize the range of contributions across the biological and biomedical research enterprise, and minimize unnecessary administrative burden. FASEB and its member societies welcome the opportunity to provide additional information and to work with NIH to develop and implement an assessment framework that advances scientific excellence while maximizing public benefit.

Respectfully submitted,

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cc: Darla P. Henderson, PhD
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