

# US scientific research enterprise should take action to protect integrity in research

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All stakeholders in the scientific research enterprise—researchers, institutions, publishers, funders, scientific societies, and federal agencies - should improve their practices and policies to respond to threats to the integrity of research, says a [new report](#) from the National Academies of Sciences, Engineering, and Medicine. Actions are needed to ensure the availability of data necessary for reproducing research, clarify authorship standards, protect whistleblowers, and make sure that negative as well as positive research findings are reported, among other steps.

The report stresses the important role played by institutions and environments - not only individual researchers—in supporting scientific integrity. And it recommends the establishment of an independent, nonprofit Research Integrity Advisory Board to support ongoing efforts to strengthen [research](#) integrity. The board should work with all stakeholders in the research enterprise to share expertise and approaches for minimizing and addressing research misconduct and detrimental practices.

"The research enterprise is not broken, but it faces significant challenges in creating the conditions needed to foster and sustain the highest standards of integrity," said Robert Nerem, chair of the committee that wrote the report, and Institute Professor and Parker H. Petit Professor Emeritus, Institute for Bioengineering and Bioscience, Georgia Institute of Technology. "To meet these challenges, all parties in the research enterprise need to take deliberate steps to strengthen the self-correcting

mechanisms that are part of research and to better align the realities of research with its values and ideals."

A growing body of evidence indicates that substantial percentages of published results in some fields are not reproducible, the report says, noting that this is a complex phenomenon and much remains to be learned. While a certain level of irreproducibility due to unknown variables or errors is a normal part of research, data falsification and detrimental research practices—such as inappropriate use of statistics or after-the-fact fitting of hypotheses to previously collected data—apparently also play a role. In addition, new forms of detrimental research practices are appearing, such as predatory journals that do little or no editorial review or quality control of papers while charging authors substantial fees. And the number of retractions of journal articles has increased, with a significant percentage of those retractions due to research misconduct. The report cautions, however, that this increase does not necessarily indicate that the incidence of misconduct is increasing, as more-vigilant scrutiny by the community may be a contributing factor.

The report endorses the definition of scientific misconduct proposed in the 1992 Academies report *Responsible Science*: "fabrication, falsification, or plagiarism in proposing, performing, or reporting research." However, many practices that have until now been categorized as "questionable" research practices - for example, misleading use of statistics that falls short of falsification, and failure to retain research data—should be recognized as "detrimental" research practices, the new report says.

Detrimental research practices should be understood to include not only actions of individual researchers but also irresponsible or abusive actions by research institutions and journals. "The research process goes beyond the actions of individual researchers," said Nerem. "Research

institutions, journals, scientific societies, and other parts of the research enterprise all can act in ways that either support or undermine integrity in research."

Because research institutions play a central role in fostering research integrity, they should maintain the highest standards for research conduct, going beyond simple compliance with federal regulations and applying these standards to all research independent of the source of funding. Institutions' key responsibilities include creating and sustaining a research culture that fosters integrity and encourages adherence to best practices, as well as monitoring the integrity of their research environments. Senior leaders at each institution—the president, other senior executives, and faculty leaders—should guide and be actively engaged in these tasks. Furthermore, they must have the capacity to effectively investigate and address allegations of research misconduct and to address the conflict of interest that institutions may have in conducting these investigations—for example, by incorporating external perspectives.

In addition, research institutions and federal agencies should ensure that good faith whistleblowers - those who raise concerns about the integrity of research - are protected and their concerns addressed in a fair, thorough, and timely manner. Inadequate responses to such concerns have been a critical point of failure in many cases of misconduct where investigations were delayed or sidetracked.

Currently, standards for transparency in many fields and disciplines do not adequately support reproducibility and the ability to build on previous work, the report says. Research sponsors and publishers should ensure that the information needed for a person knowledgeable about the field and its techniques to reproduce the reported results is made available at the time of publication or as soon as possible after that. Federal funding agencies and other research sponsors should also

allocate sufficient funds to enable the long-term storage, archiving, and access of datasets and code necessary to replicate published findings.

Researchers should routinely disclose all statistical tests carried out, including negative findings, the report says. Available evidence indicates that scientific publications are biased against presenting negative results and that the publication of negative results is on the decline. But routine reporting of negative findings will help avoid unproductive duplication of research and make research spending more productive. Dissemination of negative results also has prompted a questioning of established paradigms, leading ultimately to groundbreaking new discoveries. Research sponsors, research institutions, and journals should support and encourage this level of transparency.

Scientific societies and journals should develop clear disciplinary authorship standards based on the principle that those who have made a significant intellectual contribution are authors. Those who engage in these activities should be designated as authors, and all authors should approve the final manuscript. Universal condemnation by all disciplines of gift or honorary authorship, coercive authorship, and ghost authorship would also contribute to changing the culture of research environments where these practices are still accepted.

To bring a unified focus to addressing challenges in fostering research integrity across all disciplines and sectors, the report urges the establishment of a nonprofit, independent Research Integrity Advisory Board. The RIAB could facilitate the exchange of information on approaches to assessing and creating environments of the highest integrity and to handling allegations of misconduct and investigations. It could provide advice, support, encouragement, and where helpful advocacy on what needs to be done by [research institutions](#), journal and book publishers, and other stakeholders in the research enterprise. The RIAB would have no direct role in investigations, regulation, or

accreditation; instead it will serve as a neutral resource that helps the research enterprise respond to challenges.

In addition, the [report](#) recommends that government agencies and private foundations fund research to quantify conditions in the research environment that may be linked to research misconduct and detrimental research practices, and to develop responses to these conditions.

Provided by National Academies of Sciences, Engineering, and Medicine

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