

On Being a Scientist in a Disrupted Research Landscape

This is a moment of significant disruption for the American scientific enterprise. Scientists must navigate funding streams and research priorities that are changing rapidly, at the same time that technological advances are transforming the way research is carried out and disseminated. Growing concerns about national security and economic competitiveness mean that researchers face new expectations and responsibilities. Increased visibility of misconduct and harassment cases is contributing to greater scrutiny of scientists. And public trust in science remains lower than before the COVID-19 pandemic.

These trends have made it ever more important that researchers are well versed in the ethics, norms, and standards of the scientific enterprise. *On Being a Scientist (OBAS)*, which was first published by the National Academies of Sciences, Engineering, and Medicine (NASEM) in 1989 and updated in 1995 and 2009, explicitly aims to train young scientists to act responsibly and ethically, be good stewards of public funding and trust, and navigate the broader responsibilities that come with being a scientist in this rapidly shifting landscape.

The new edition of *OBAS*, released this year, tackles the current context for science and scientific education. The update reflects the ways the practice of science has evolved since the last release in 2009, as well as how different financial and geopolitical conditions are shaping the operation of the scientific enterprise.

The latest edition highlights how shifts in research priorities and funding place new expectations and pressures on scientists. Federal funding for research has declined

both in inflation-adjusted terms and as a share of total government spending since 2009. Private sector and philanthropic spending on domestic research now exceed the federal contribution. These changes have led scientists to increasingly pursue research for technological innovation and entrepreneurship or to focus on research that addresses societal and regulatory needs.

Another change is that science has become much more collaborative and cross-disciplinary, which requires researchers to work in larger groups or with new external partners and communities. Earning and maintaining public trust in this new environment entail considerations beyond research transparency, reproducibility, and integrity. *OBAS* now highlights the importance of earning and maintaining trust, both within research labs and in a broader institutional and public context.

The past two decades have seen major advances across many scientific fields, including the rapid evolution of biotechnology, information science, and artificial intelligence, that may revolutionize the way science is conducted. While this progress has generated tremendous new capabilities (mRNA vaccines, self-driving cars, generative AI models, among others), it has also raised concerns about research security, particularly for technologies that may have both civilian and military applications. *OBAS* explicitly addresses research security considerations and highlights the obligation of scientists to consider downstream consequences of their work, while recognizing that not all consequences can be foreseen.

Other technological advances require scientists to be deliberate about the way research is communicated, credit is allocated, and scientific impact is measured. The emergence of social media has altered the way scientific advances are communicated among the scientific community as well as to the public. Generative AI tools are increasingly playing a role in the writing, reviewing, and editing processes for scientific publications. And the emergence of open access publishing has had both positive and negative effects: Although open access has enhanced transparency and reproducibility in science, it has also contributed to the rise of predatory publishing practices that dilute the value of the peer-review process.

One important change since the last edition is that early career researchers are joining the enterprise with different experiences, skills, and expectations. In particular, contemporary understanding of responsible conduct extends beyond the integrity of the research itself, to the way scientists treat, train, and supervise the people with whom they work and the ways in which they relate to the broader society. A growing body of research examining the

responsible research conduct. They were relatively short and focused largely on the responsibilities of individual scientists in conducting and communicating research. The new *OBAS* retains this core purpose but places responsible conduct in a broader scientific and societal context, giving substantially greater attention to earning and maintaining trust. These changes reflect a broader understanding of what it means to act responsibly as a scientist. In addition to considering how research is designed, conducted, and reported, responsible conduct must encompass how scientists interact with their colleagues and broader communities and how they consider the consequences of their work.

Importantly, the format of *OBAS* has been changed to take advantage of the flexibility provided by a digital publishing environment. While previous editions were traditional print publications that were updated infrequently, the new *OBAS* is an online, modular resource (though a PDF of the full document can also be generated). Interactive case studies ask researchers to consider how principles of responsible conduct apply when the appropriate course of action is not always obvious. The modular structure also allows individual

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prevalence and consequences of harassment, bullying, and abuses of power in academic settings has contributed to a greater awareness of how these behaviors can make research environments unsafe or inequitable. A 2018 NASEM consensus report highlighted the role of institutional culture and power imbalances between faculty and trainees in creating environments where harassment can occur. Young researchers increasingly expect institutions to provide clear reporting pathways and to hold mentors and supervisors accountable for creating productive research environments.

The relationship between early-career researchers and their research institutions is also changing. Graduate students and postdoctoral researchers have increasingly organized and unionized to seek better compensation, benefits, and working conditions. These developments reflect a broader recognition that early-career scientists are not only trainees but important members of the scientific workforce. As a result, questions about responsible research conduct are more readily connected to questions about power dynamics, working conditions, mentorship, and institutional responsibility.

Previous editions of *OBAS* primarily served as guides to

topics to be updated as research practices, technologies, and expectations change.

Changes to the structure of the American scientific enterprise and its relationship with society are impacting all scientists. Even so, early-career researchers feel the consequences most acutely, when career progression relies on success in a landscape characterized by uncertain resources, rapid technological changes, and increasing pressure to demonstrate the value of their work. The new content and format of *OBAS* aim to make it a timely and effective guide for scientists to behave responsibly and ethically while addressing these challenges.

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