

Plenary Address: Survival of the Fittest: Evolution as Applied to the Future of Scientific Publishing

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Dr. Marcia McNutt, president of the US National Academy of Sciences (NAS), addressed the participants of the 60th CSE Annual Meeting on Tuesday, May 23. McNutt, who holds a BA in physics and a doctorate in earth sciences, has served as the director of the US Geological Survey (USGS), editor-in-chief of *Science*, and president of the American Geophysical Union (AGU). The focus of McNutt's talk was the crucial role of the publishing community in the scientific ecosystem. Throughout her presentation, she drew analogies between the evolution of a resilient ecosystem and a thriving scientific publishing community.

McNutt began by asking, "What does the future of scientific publishing look like?" Evolutionary change is often subtle and not easily seen if viewed too closely, and scientific publishing has experienced transitions akin to evolutionary shifts throughout its history. Currently, we are seeing the industry transform through the adoption of a preprint culture in the biological sciences, different models of open access publication, and new models of peer review. The editor of the first scientific journal, *Philosophical Transactions*, could not have imagined the evolution of the scientific publishing more than 350 years later. McNutt remarked, "Every time is a time of huge change."

McNutt noted that our goal in the scientific publishing community is to foster a strong and resilient publishing system. As an analogy, a thriving ecosystem is one that is diverse, contains redundancy, and has stable structure. A scientist studying ecosystems looks for these three attributes. Starting with diversity, McNutt drew parallels with publishing: Having a large number of scientific outlets for authors can boost productivity. There is a journal for every paper. Redundancy in a system can prevent a single point of failure. In an ecosystem, if disappearance of a single food source threatens the ecosystem, it lacks resilience. Scientific publishing, in comparison to the system for funding scientific

research, is a far more resilient system. Investigators rarely have a diversity of options for agencies to fund their research if their proposal is rejected. In contrast, authors have the option of many tiers of publications for disseminating their research, such that any technically correct work will ultimately find an outlet.

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McNutt continued with a story about the wolves of Yellowstone National Park to illustrate the importance of a stable structure within an ecosystem. The wolves are keystone predators in Yellowstone. Without them, the population of grazers grew unchecked, causing an imbalance in the food chain, but their reintroduction stabilized the food chain and allowed the ecosystem once again to thrive. According to McNutt, stable structure in publishing is also necessary: Publishers need to ensure that all stakeholders in the publishing enterprise—authors, editors, publishers, funders, libraries, and institutions—execute their assigned roles with integrity and following agreed-upon rules and conventions. This promotes stability.

McNutt referenced the 2017 National Academies study *Fostering Integrity in Research*,¹ which describes the best practices and policies for all parties involved in scientific publishing. She noted that authorship policies must include appropriate disclosure of relationships and thwart ghost or honorary authorship. Detrimental research practices are a threat to the scientific ecosystem, so one recommendation from the NAS study is the creation of a Research Integrity Advisory Board, an independent nonprofit organization to foster research integrity across disciplines and all stakeholders. According to the study, a national-level body could work with public and private sectors to develop best practices and approaches as well as identify topics and questions related to improving research integrity.

Along similar lines, McNutt discussed a recent Sunnylands retreat with the editors and leaders of several journals and scientific societies to examine authorship standards, expectations for corresponding authors, and improving

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transparency in author contributions. The results of the retreat are documented in a preprint titled, "Transparency in Authors' Contributions and Responsibilities to Promote Integrity in Scientific Publication."² McNutt encouraged members of the CSE community to comment on the article.

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The preprint advocates for advancing authorship standards, including electronic capture of author contributions in journal metadata. The authors also recommend that journals explicitly outline the responsibilities and expectations of the corresponding author, such as circulating drafts of the work to all coauthors, serving as a point of contact for the journal, and ensuring data, materials, or code are appropriately deposited or available. The CRediT taxonomy is suggested as an appropriate standard for authorship contributions, although it is only a first step in terms of capturing all of the details that authors may want to declare. ORCIDs are likewise recommended to disambiguate authors with common surnames and to provide a single, validated resource for discovering a researcher's publications and contributions. The preprint recommends that universities and research

institutions regularly train and update researchers on the criteria for coauthorship to ensure appropriate authorship is established early on in a research project.

In her closing comments, McNutt offered the following quote, often attributed to Charles Darwin: "It is not the strongest species that survive, nor the most intelligent, but the ones most responsive to change." McNutt opined that the issue of authorship contributions is lagging behind and not leveraging currently available technologies. Further evolution must be supported and encouraged to maintain a vibrant publishing ecosystem. Increased transparency within the system is needed as, even within the scientific community, there are varying conventions related to authorship, disclosure, and access to data. McNutt concluded her remarks with the injunction "Change is coming, and transparency is needed."

References

1. National Academies of Sciences, Engineering, and Medicine. *Fostering integrity in research*. Washington, DC: The National Academies Press; 2017. <https://doi.org/10.17226/21896>
2. McNutt M, Bradford M, Drazen J, Brooks Hanson R, Howard B, Hall Jamieson K, Kiermer V, Magoulas M, Marcus E, Kline Pope B, et al. Transparency in authors' contributions and responsibilities to promote integrity in scientific publication. *bioRxiv*. 140228. <https://doi.org/10.1101/140228>