Common Fund Journal Editors' Workshops

Executive Summary

October 18, 29, and 30, 2018

The views expressed in this document reflect opinions of the meeting participants and not necessarily those of the National Institutes of Health.

Introduction

Common Fund programs are designed to achieve specific, high-impact goals within a 5- to 10-year timeframe. Therefore, as existing programs end, funds are freed to launch new programs. Strategic planning to identify potential new Common Fund programs is undertaken annually and engages a broad range of stakeholders both within and outside of NIH. As part of the planning process for potential Common Fund programs in fiscal year 2021 and beyond, OSC hosted a series of three video workshops with journal editors from a diverse array of scientific disciplines to learn about new scientific trends, technologies, and approaches. Ultimately, these discussions may contribute to new Common Fund research programs or initiatives.

Welcome and Setting the Stage

James Anderson, MD, PhD, Deputy Director, DPCPSI

Dr. Anderson welcomed attendees and explained that these workshops are a part of the Common Fund's annual strategic planning process and are designed to generate ideas for developing future programs. For the first time, NIH is seeking input from scientific journal editors from diverse disciplines to gain their unique perspective on emerging areas of science, cross-cutting challenges, and novel tools or technologies. Journal editors, with their exposure to and assessment of new scientific advances, are in a good position to understand the current scientific landscape.

Dr. Anderson asked the journal editors to consider the following four questions during the workshop discussion:

1. Are you seeing new types of challenges that researchers are starting to address in submissions to your journals? What approaches and technologies are they proposing to solve these problems?
2. Are you seeing new approaches, methods, and technologies being used by researchers in their manuscript submissions? Do these approaches, methods, or technologies offer potential for broader adoption in other fields?
3. For your journal, and in discussions with other editors, do you see any trends toward new research areas or leaps in a current research area?
4. Artificial intelligence (AI) and machine learning are technologies that are being increasingly used in biomedical research. How are AI and machine learning affecting your discipline and journal?

Participant-Led Discussion

The journal editors discussed several topics during the workshops. Major themes that emerged from the series include the following:

- **Data analysis** – Technology now provides scientists with an exceptionally large amount of data but analyzing those data poses challenges. Machine intelligence, neural networks, and computational tools should make analyses faster and more robust. Additionally, cloud computing advances will facilitate storage and analysis, but barriers to access, affordability, and technology remain to be solved. Participants noted the need for increasingly sophisticated types of data analysis, including connections between different biological scales, spatial translation of data, and functional (rather than descriptive) analyses.

- **Data deposition and sharing** - Idiosyncrasies exist among disciplines for data sharing and data deposition, and challenges exist in developing and maintaining platforms for data sharing. Support for long-term data maintenance and development of common meta-data standards were identified as areas of need.

- **Enhancing complex data sets** – Many research areas could be accelerated by widespread access to high-quality, integrated data sets. Examples of fields that could benefit are nutrition research, research on environmental exposures, and research on health effects of climate change.

- **AI and machine learning and applications for data** – Artificial Intelligence (AI) and machine learning hold great promise for many research areas, including interpretation of complex genetic sequencing results, clinical diagnosis, determining disease prognosis, enhancing rigor and reproducibility in research, synthesizing scientific findings, and integrating large amounts of data from different sources. Currently, there are challenges with making innovative hardware/software freely accessible and ensuring quality of the data.

- **Scientific rigor and reproducibility** – There are many issues affecting scientific rigor and reproducibility, including publication bias toward positive findings, lack of randomization, switching endpoints mid-study, not providing intent-to-treat analyses, and improper use of statistics (e.g., p-hacking). Potential solutions may include requiring pre-registration of all studies, reporting all primary endpoints together, registering analytical plans, providing perspective in how results are reported (e.g., affect size, absolute risk), and requiring mandatory reporting guidelines with penalties for noncompliance.

- **Translation and clinical studies** – Novel approaches to studying and treating humans are needed. In particular, there is a need for reporters or biomarkers linking mechanisms with specific diseases. Additionally, rapid responses to emerging infections diseases will require improved surveillance of emerging pathogens and the development of appropriate systems/models to study novel pathogens.

- **Drug discovery and development** – New drugs may be developed from previously untapped sources, such as natural products. Additionally, sophisticated techniques such as molecular networking could be used to isolate bioactive molecules within mixtures. Development of laboratory-based systems for manufacturing and producing bioactive molecules (nucleic acids, proteins, viral particles) could revolutionize drug development, leading to improvements in precision medicine and drug pricing.

- **Annotating human genome variation** – Moving beyond genome sequencing, the next critical step is to more fully annotate the genome to understand functionality. There is a need to understand the functional significance of genome variants in order to accurately assign disease risk, develop targeted therapeutics, and to more fully comprehend the impact of individual variability.

- **Sensor technologies and wearable devices** – Wearable sensors and other related devices would be very valuable for studies of nutrition, obesity, activity, and behavior. Such devices could allow more accurate data on behavior "in the wild," but additional policies may be needed to ensure data quality.

- **Cell, tissue, and organ preservation** – Recent technological advances could be leveraged to improve cell, tissue, and organ preservation. This would improve clinical medicine as well as biomedical research in organ and limb transplantation, onco-fertility (sparing fertility tissues prior to chemotherapy), cold adaption/hibernation, cryoprotection, and ex vivo perfusion technologies.

- **Computational biology** – Computational biology has the potential to impact many biomedical research fields by supporting mechanistic/functional analyses, analyses of complicated environments with thousands of variables, differences/similarities between model organisms and humans, and many others. Computational biology tools need to be made accessible and useable, and may also be integrated with methods for developing AI.

- **New models for publishing data** – The role of journals is likely to evolve, especially in how they disseminate information. New approaches to dissemination may include development of platforms to archive data, methods and prespecified questions, with journal editors providing commentary on what is most interesting and promising, as well as shifting towards journal articles as "living documents" that can be updated with new results over time.

- **Clinical guidelines** – Many published clinical guidelines lack evidence, and research agendas do not always address these gaps. Focusing on these research gaps could be a novel way to prioritize research areas. There is also a need to develop rigorous methods for summative research, such as systematic reviews, and a need for new methods to analyze large amounts of data to answer clinical questions in many disciplines.

Appendix A: Participants List

NIH OD Staff

James Anderson, MD, PhD, Deputy Director, DPCPSI

Elizabeth Wilder, PhD, Director, OSC, DPCPSI

Stephanie Courchesne-Schlink, PhD, Team Leader, Policy, Planning, Evaluation, and Communication, OSC, DPCPSI

Stephanie Morris, PhD, Program Officer, OSC, DPCPSI

Journal Editors

Editor	Journal
Dolores Albarracín, PhD	*Psychological Bulletin*
Dennis Bier, MD	*American Journal of Clinical Nutrition*
Inês Chen, PhD	*Nature Structural and Molecular Biology*
Gregory Copenhaver, PhD	*PLoS Genetics*
Nelson Cowan, PhD	*Journal of Experimental Psychology—General*
Sally Darney, PhD	*Environmental Health Perspectives*
Susan Fiske, PhD	*Annual Review of Psychology*
Lila M. Gierasch, PhD	*Journal of Biological Chemistry*
Lakshmi Goyal, PhD	*Cell Host & Microbe*
Mary Beth Hamel, MD, MPH	*New England Journal of Medicine*
A. Douglas Kinghorn, PhD, DSc	*Journal of Natural Products*
Bruce Korf, MD, PhD	*American Journal of Human Genetics*
Christine Laine, MD, MPH	*Annals of Internal Medicine*
K.W. Leong, PhD	*Biomaterials*
Andrew Marshall, PhD	*Nature Biotechnology*
Alfredo Morabia, MD, PhD	*American Journal of Public Health*
Marcus Munafò, PhD	*Nicotine and Tobacco Research*
Tal Nawy, PhD	*Nature Methods*
Jason Papin, PhD	*PLoS Computational Biology*
Jerome Sanes, PhD	*Neuroscience*

Orla Smith, PhD	*Science Translational Medicine*
Clare Stone, PhD	*PLoS Medicine*
Alfonso Valencia, PhD	*Bioinformatics*