

An Effort to Advance Scientific Communication and Open Access Publishing

Final report of the 2017–2018 partnership between the
American Association for the Advancement of Science and
the Bill & Melinda Gates Foundation

This report describes the results of an 18-month partnership in 2017–2018 between the American Association for the Advancement of Science (AAAS) and the Bill & Melinda Gates Foundation that focused on advancing scientific communication and open access to research findings and data. AAAS works to enhance communication among scientists, engineers and the public and to foster education in science and technology. AAAS believes in empowering authors with choice and supports OA options that meet standards set by the scientific community, contribute to the accurate record of published scientific content, and protect the overall integrity of that content. It publishes six peer-reviewed journals: *Science*, *Science Signaling*, *Science Translational Medicine*, *Science Advances*, *Science Immunology*, and *Science Robotics*.¹ The Bill & Melinda Gates Foundation, the world’s largest private philanthropy, works with partners to develop innovative solutions in global health, development, and education.

To accelerate the impact of the research it supports, the foundation implemented an [Open Access Policy](#) in 2015, which enables unrestricted access to and reuse of all peer-reviewed published research supported by foundation funding, including any underlying data sets. The policy went into effect on January 1, 2015, with a two-year transition period during which publishers could impose an embargo on access for up to 12 months. The policy included payment by the foundation of reasonable fees to effect publication on these open access terms.

To facilitate implementation of this policy, the foundation invested in the development of a platform called [Chronos](#), which helps funders and research institutions manage their publishing compliance policies and article submissions and enables authors to easily identify journals that meet their organization’s publishing requirements.

During the partnership period—January 1, 2017, to June 30, 2018—foundation-funded authors whose work was accepted by *Science*, *Science Translational Medicine*, *Science Signaling*, *Science Immunology*, or *Science Robotics* were required to publish under a Creative Commons Attribution (CC BY) license. (*Science Advances* already met the foundation’s open access terms.) This license allows others to read, download, reuse, and build on an author’s work, as long as that work is appropriately credited.

The partnership provided an opportunity for AAAS and the foundation to explore options for broadening access to scientific research, as well as to survey researchers on their open access experience and preferences.

A total of 44 articles by foundation grantees were published in the *Science* family of journals under the terms of the partnership. The following section lists these articles.

The partnership included an online survey of 568 authors who had recently published in one or more of the *Science* family journals, with the goal of better understanding and accommodating author needs and preferences related to open access publishing and identifying authors’ top criteria when choosing where to submit articles. Details about the survey and its results are included later in this report.

The partnership did not identify a mutually agreeable business model to support open access publishing in the longer term, but both parties remain open to exploring future opportunities.

¹ In 2015, AAAS began offering gold open access—publication in an open access online journal—via *Science Advances*, which charges authors an article processing fee. The other five *Science* family journals are subscription based and have green open access policies, which allow authors to place their accepted manuscript in an institutional repository or personal website upon publication, with no processing fees imposed. AAAS also makes all research articles of immediate relevance to public health concerns or that report the reference sequence of a genome free for reading upon publication. In addition, it participates in several programs that allow free or low-cost access to content in low- and middle-income economies. Regardless of topic, AAAS makes all published articles free to all readers 12 months after publication.

Foundation Grantee Articles Published During the Partnership Period

The following articles by foundation grantees were included in the partnership and published in *Science* family journals.

Science = *Science*

IMM = *Science Immunology*

SIG = *Science Signaling*

STM = *Science Translational Medicine*

| Journal | First Author | Title | Submission Date | Publish Date |
|---------|--------------|--|-----------------|--------------|
| Science | Koppel | Chemical transformation of xenobiotics by the human gut microbiota | 1/10/17 | 6/23/17 |
| Science | Reynolds | Improving global integration of crop research | 1/25/17 | 7/28/17 |
| IMM | Aghaeepour | An immune clock of human pregnancy | 3/23/17 | 9/1/17 |
| Science | McHugh | Fabrication of fillable microparticles and other complex 3D microstructures | 3/27/16 | 9/15/17 |
| STM | Shalek | Single cell analyses to tailor treatments | 4/18/17 | 9/20/17 |
| Science | Van Boeckel | Reducing global antimicrobial use in food animals | 6/19/17 | 9/29/17 |
| STM | Pinter | Targeting the renin-angiotensin system to improve cancer treatment: Implications for immunotherapy | 5/1/17 | 10/4/17 |
| Science | Mayer | The microanatomic segregation of selection by apoptosis in the germinal center | 6/30/17 | 10/13/17 |
| IMM | Shahine | A molecular basis of human T cell receptor autoreactivity toward self-phospholipids | 6/18/17 | 10/20/17 |
| Science | Nasamu | Plasmeepsins IX and X are essential and druggable mediators of malaria parasite egress and invasion | 3/10/17 | 10/27/17 |
| Science | Katzelnick | Antibody-dependent enhancement of severe dengue disease in humans | 5/27/17 | 11/17/17 |
| Science | Casañal | Architecture of eukaryotic mRNA 3'-end processing machinery | 8/11/17 | 11/24/17 |
| Science | Emerson | Principles for gene drive research | 9/7/17 | 12/1/17 |
| STM | Coghlan | A degradation fragment of type X collagen is a real-time marker for bone growth velocity | 4/20/17 | 12/6/17 |
| STM | Paris | Urine lipoarabinomannan (LAM) glycan in HIV negative patients with Pulmonary TB correlates with disease severity | 10/25/16 | 12/13/17 |
| Science | Salcedo | Variation in the AvrSr35 gene determines Sr35 resistance against wheat stem rust race Ug99 | 8/21/17 | 12/22/17 |
| Science | Ramsuran | Elevated HLA-A expression impairs HIV control through inhibition of NKG2A expressing cells | 1/30/17 | 1/5/18 |
| Science | Cowell | Mapping the malaria parasite drug-able genome using in vitro evolution and chemogenomics | 5/15/17 | 1/12/18 |
| Science | Guna | The ER membrane protein complex is a transmembrane domain insertase | 7/6/17 | 1/26/18 |
| STM | McDonald | Malaria in pregnancy alters L-arginine biogenesis and placental vascular development | 5/6/17 | 3/7/18 |
| Science | Thaiss | Hyperglycemia drives intestinal barrier dysfunction and risk for enteric infection | 10/26/17 | 3/23/18 |
| STM | Tiwari | Targeting protein biotinylation enhances tuberculosis chemotherapy | 10/9/16 | 4/25/18 |
| Science | Baker | Global insights into the emergence and spread of antimicrobial-resistant bacterial pathogens | 2/19/18 | 5/18/18 |
| Science | Ngo | Noninvasive blood tests for fetal development predict gestational age and preterm delivery | 11/1/17 | 6/8/18 |
| STM | Mao | Probiotic strains detect and suppress cholera in mice | 6/30/17 | 6/13/18 |
| Science | Imkeller | Antihomotypic affinity maturation improves human B cell responses against a repetitive epitope | 11/18/17 | 6/22/18 |
| IMM | Harriff | MR1 displays the microbial metabolome driving selective MR1-restricted T cell receptor usage | 6/30/17 | 7/13/18 |
| Science | Lavery | Building an evidence base for stakeholder engagement | 4/9/18 | 8/10/18 |
| IMM | Lofano | Antigen-specific antibody Fc-glycosylation enhances humoral immunity via the recruitment of complement | 4/3/18 | 8/17/18 |

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|---------|---------------|--|----------|---------|
| Science | Bloom | The promise and peril of universal health care | 6/15/18 | 8/24/18 |
| SIG | Torrent | Cells alter their tRNA abundance to selectively regulate protein expression during stress conditions | 3/20/18 | 9/4/18 |
| Science | Dalziel | Urbanization and humidity shape the intensity of influenza epidemics in U.S. cities | 3/15/18 | 10/5/18 |
| Science | Antonova-Koch | Open-source discovery of chemical leads for next-generation chemoprotective antimalarials | 4/26/18 | 12/7/18 |
| STM | Tao | A saliva-based rapid test to quantify the infectious subclinical malaria parasite reservoir | 4/22/17 | 1/2/19 |
| Science | South | Synthetic glycolate metabolism pathways stimulate crop growth and productivity in the field | 4/17/18 | 1/4/19 |
| Science | Corder | An amygdalar neural ensemble that encodes the unpleasantness of pain | 11/19/17 | 1/18/19 |
| STM | Azman | Estimating cholera incidence with cross-sectional serology | 6/29/18 | 2/20/19 |
| Science | Chung | Binodal, wireless epidermal electronic systems with in-sensor analytics for neonatal intensive care | 5/4/18 | 3/1/19 |
| STM | Verma | A gastric resident drug delivery system for prolonged gram-level dosing of tuberculosis treatment | 6/29/18 | 3/13/19 |
| STM | Babae | Temperature-responsive biometamaterials for gastrointestinal applications | 7/21/18 | 4/17/19 |
| Science | Graham | Measles and the canonical path to elimination | 6/29/18 | 5/10/19 |
| Science | Rekdal | Discovery and inhibition of an interspecies gut bacterial pathway for Levodopa metabolism | 6/29/18 | 6/14/19 |
| Science | Gehrig | Effects of microbiota-directed foods in gnotobiotic animals and undernourished children | 6/13/18 | 7/12/19 |
| Science | Raman | A sparse covarying unit that describes healthy and impaired human gut microbiota development | 6/13/18 | 7/12/19 |

Author Survey Results and Analysis

AAAS conducted an online survey to better understand author experiences and preferences related to publishing in traditional subscription-based vs. open access publications. About 35,000 individuals from the AAAS database received email invitations to participate—25,000 in the United States and 10,000 in other countries. A prize drawing for one of five \$100 Amazon gift cards was offered to individuals in the United States as an incentive to participate; individuals in other countries were not offered any financial incentive.

The survey was open from November 16, 2017, to December 4, 2017. During that 18-day period, 568 authors responded to the survey, for a response rate of 1.6% (1.5% for the U.S. group and 2.0% for the international group). All of the responses, even from surveys that were only partially completed, are included in the results. The full set of data has a margin of error of less than plus or minus 4.1% at a 95% confidence level.

The results are summarized below.

Demographics

Author Location

64% North America
 20% Europe
 9% Asia, Australia, Pacific Rim
 7% Central or South America
 2% Middle East or Africa

Primary Research Field

62% life science or medicine
 9% earth science

8% physics and astronomy
7% chemistry
5% social and behavioral science
5% engineering
3% mathematics and computer science
1% humanities

Age

2% under age 30
44% age 30 to 49
39% age 50 to 64
14% age 65 or older
1% no response

Gender Identification

72% male
25% female
3% prefer not to respond

Work Setting

69% university or academe
11% government
8% nonprofit research
7% for-profit company
3% hospital or medical
2% retired

Publishing Experiences and Preferences

Experience with Open Access Journals

52% had published one or more open access articles in gold open access² or hybrid model³ journals
30% had not published any open access articles in gold open access or hybrid model journals
18% not sure

Primary Reason for Having Published in an Open Access Journal (either Gold or Hybrid)

47% author or co-author preference for open access publications
8% required or encouraged by a funder
4% required or encouraged by their institution
37% no preference between open access and subscription journals; journal happened to be open access
4% other (e.g., the paper was rejected by traditional subscription-based journals)

Reasons for Not Having Published in an Open Access Journal

54% cost was too high
22% perceived lower quality of such publications compared to traditional subscription-based journals
11% had not found an appropriate open access publication for their paper
10% prefer traditional publications

² A gold open access journals allows permanently free access to its articles to everyone upon publication.

³ Journals that use the hybrid model offer authors the option to make their work openly accessible, for a fee.

4% not very familiar with open access
3% have not published lately
3% other (e.g., concerns about misuse of information or copyright restrictions)
4% not sure

Number of Papers Published in the Previous 3 Years

17% published 0 to 2 papers
29% published 3 to 5 papers
18% published 6 to 8 papers
36% published 9 or more papers

Authors Who Published in the Previous 3 Years: Open Access or Not?

27% no articles published in open access journals
49% some articles published in open access journals
12% most articles published in open access journals
6% all articles published in open access journals
6% not sure

Authors Who Published in the Previous 3 Years: How Often They Influenced the Choice of Journal in the Past 12 Months

28% all of the time
34% most of the time
12% about half the time
17% a few times
7% never
2% not sure

Factors Important to Authors When Choosing Where to Submit Articles (4 or 5 on a 1-to-5 Scale)

96% quality of the journal
86% journal is read by peers
86% quality of the journal's peer review process
77% speed of the review and publication process
76% impact factor of the journal
72% scope of the journal
64% reputation of the publisher
60% cost of publishing in the journal
45% recommendation from colleagues
32% the journal being open access
27% retraction rate of the journal

Preferred Type of Creative Commons License

21% CC-BY
15% CC-BY-NC-ND
13% CC-BY-NC
10% CC-BY-SA
7% depends on the nature of the article being submitted
34% not sure

Opinions on Open Access Publishing

Are Open Access publications advantageous to the creation and dissemination of scientific research?

74% yes
11% no
15% not sure

Assuming similar impact factors and reputations, should publishing in open access journals be factored into promotion and tenure evaluation?

37% yes
41% no
22% not sure

Opinions on Open Access Mandates from Funders

33% they are critical to opening scientific research globally
16% they are easy to follow
10% they improve the research process
13% they complicate the research process
10% they are hard to understand
6% other
38% not familiar with them

Opinion on Quality of Papers in Open Access Journals vs. Traditional Subscription-based Journals

1% generally higher
30% generally of the same quality
23% generally lower
36% it depends
10% not sure

Who should take the lead role in shaping research communications and Open Access policy?

39% researchers/authors
24% funding organizations
10% publishers
8% universities
6% government
2% other
11% not sure