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Key Principles

for Scientific

Publishing

AND THE EXTENT
TO WHICH THEY
ARE OBSERVED



**International
Science Council**

The global voice for science

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These principles are published by The International Science Council,
5 rue Auguste Vacquerie, 75116 Paris, France

To cite this document:

Title: Key Principles for Scientific Publishing

URL: <https://council.science/publications/key-principles-for-scientific-publishing>

Publisher: International Science Council

Publication date: 17/11/2023

DOI: 10.24948/2023.13

About the International Science Council

The International Science Council (ISC) works at the global level to catalyze and convene scientific expertise, advice and influence on issues of major concern to both science and society. The ISC has a growing global membership that brings together over 245 organizations, including international scientific unions and associations from natural and social sciences, and the humanities, and national and regional scientific organizations such as academies and research councils.

These principles have been developed by International Science Council members as part of the Council's *Future of Publishing* project and are a companion piece to "The Case for Reform of Scientific Publishing", <https://council.science/publications/reform-of-scientific-publishing>

Cover Illustration: Harryarts / Freepik

Graphic Design: [Mr. Clinton](#)

Background to the Principles

In 2019, shortly after the creation of the International Science Council, its members, primarily international scientific Unions and Associations, national and regional scientific organizations including Academies and Research Councils, and international Federations and Societies, were asked to identify what they considered to be the most important contemporary issues for science.

Scientific publishing was most frequently identified as the single most important issue of “policy for science” and was adopted as a priority for the ISC’s first action plan for 2019-2021. The ISC Governing Board then set up an international working group with the composition shown below, with the remit to suggest principles for scientific publishing required to serve the needs of science, and to evaluate the extent to which reform might be needed.

Substantive work was undertaken by the group during 2020, including three consultation workshops with ISC members in late 2020 to gain feedback on the project. The paper concluded that reform was needed and should be based on seven key principles, with which between 80% and 90% of members concurred. A revised document was then presented for review to an expert team generously convened by the U.S. National Academies of Sciences, Engineering and Medicine, and further revised before being submitted to the ISC Governing Board, which agreed that it should be published as an ISC Report: *Opening the Record of Science: making scholarly publication work for science in the digital era* (doi.org/10.24948/2021.01). Subsequent discussions added an eighth principle, that scientific publishing should in some way be accountable to the scientific community.

This paper summarises the eight principles that were laid before the General Assembly of the International Science Council in October 2021, when they were overwhelmingly endorsed.

The following discussion paper which sits as a companion to these principles, *Two: The Case for Reform of Scientific Publishing*, evaluates the extent to which the principles are attained in practice, thereby identifying issues for reform.

International working group

- Bianca Amaro, Brazil
- Dominique Babini, Argentina
- Michael Barber, Australia
- Geoffrey Boulton, UK (Chair)
- Robin Crew, South Africa
- Luke Drury, Ireland
- Professor Martin, UK
- Sari Hanafi, Lebanon
- Mary Lee Kennedy, USA
- Nathalie Lemarchand, France
- Anna Mauranen, Finland
- Dr Ravi Murugesan, India
- Joseph Mwelwa, Botswana
- François Robida, France
- Peter Strickland, UK
- Zhang Xiaolin, China

1
Universal open
access for authors
and readers



2
Open licenses
permitting reuse and
text and data mining



3
Rigorous, timely,
ongoing peer
review



4
Data and observations
should be concurrently
accessible and supported
by metadata



5
Ensure open access
by future generations



8
Governance of
dissemination of
scientific knowledge
to be accountable to
scientific community



7
Design flexible
publications systems
to adapt to new
opportunities



6
Respect publication
traditions and bibliodiversity
of disciplines and regions



Fundamental Principles for Scientific Publishing

1. The rapid and global circulation of ideas is central to the scientific process. There should be universal, prompt open access to the record of science¹, both for authors and readers, with no barriers to participation, in particular those based on ability to pay, institutional privilege, language or geography.



Excessive prices place much of the record of science beyond the reach of many authors and readers. True open access is affordable to both readers and authors. The commercial publishing business model is based on evaluations of scientific quality using indirect, proxy, bibliometric measures that incentivise publication in excessively costly journals which sell indices of status that are not directly based on the quality of science. This process drives up the cost of commercial publications and is unaffordable by many, thereby fracturing the international science community, and creating an obsession with publication that works to the detriment of other vital scientific activities. This sale of status indicators by major commercial journals is in danger of displacing efficient and effective regional publishing systems. The indexes that record scientific publication are agents of discovery of scientific work. They are biased towards the output of the “global north”, thus rendering invisible much of the knowledge produced in the “south”.

2. Scientific publications should have a default position of carrying open licences that permit reuse and text and data mining. Too much of the record of science is inaccessible for reuse and the application of modern methods of knowledge discovery because of restrictive licences that sustain high paywalls. Some publishers monopolize metadata by limiting access to knowledge.



3. Rigorous, timely and ongoing peer review must continue to play a key role in creating and maintaining the public record of science.

Peer review is crumbling under the weight of demand. It is too limited in its scope, and often slow and inconsistent with scientific rigour. More efficient, scalable processes of open peer review already exist, which can also be used in pre- and post-publication systems of review that can enhance the development of scientific concepts, rather than being an ephemeral pre-publication time slice, bring benefit to reviewers, better utilize the resources of scientific institutions and mobilize the potential of automated procedures.



¹ The “record of science” is the record of scientific knowledge and understanding from the earliest days of scientific inquiry to the present. It is continually refreshed, renewed and re-evaluated across the disciplines of science by new experiments, new observations and new theoretical insights. Perennial scrutiny is at the core of the value of science. It can invalidate, but cannot validate; it is the basis of so-called scientific self-correction.

4. The data and observations on which a published truth claim is based should be concurrently accessible to scrutiny and supported by necessary metadata.

It is a fundamental tenet of the scientific method that evidence supporting a published claim must be concurrently available for peer scrutiny. Data should be accessible under FAIR (Findable–Accessible–Interoperable–Reusable) principles and with appropriate safeguards for safety, security, or privacy.



5. The record of science should be maintained in such a way as to ensure open access by future generations.

Sorting algorithms already exist that can be applied to create an inclusive “record of versions” accessible to researchers in ways that do not merely direct them to an exclusive “version of record”. Such a shift is vital. It would circumvent the processes that direct researchers along limiting pathways towards the “high impact” journals of the “global north” with much of the southern output becoming invisible.



6. Modes of publication and bibliodiversities in different disciplines and regions need to be adapted to relevant needs, but in ways that also to facilitate inter-operability between different disciplines and regions, including procedures for multi-lingual communication.

Technological developments on both fronts are now able to address these issues. There should be a concerted programme for such innovations.



7. Publication systems should be designed to continually adapt to new opportunities for beneficial change rather than embedding inflexible systems that inhibit change.

Outmoded models of publication derived from the print era should be displaced by more rapid, efficient, flexible open-source forms and other functionalities of the digital age. Such a transition is vital for the needs of science and society.



8. Governance of the processes of dissemination of scientific knowledge should be accountable to the scientific community.

Access to scientific knowledge and to research assessment indicators is increasingly monopolized by major commercial publishers and technology companies whose principal responsibility is to their investors rather than to science or the public good. As data and artificial intelligence technologies play an increasing role in science, it is more vital than ever that the interests of science take priority through accountability for key standards to the science community.

