Open science: Pursuing development through communication, cooperation and sharing

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There is an increasing consensus among the international community that cooperation and the sharing of knowledge provide a pathway for solving global challenges and achieving sustainable development. As UNESCO has noted: ‘In the context of pressing planetary and socio-economic challenges, sustainable and innovative solutions require an efficient, transparent and vibrant scientific effort—not only stemming from the scientific community, but from the whole society.’ Thus arises the idea of open science, the principle of which is to allow ‘scientific information, data and outputs to be more widely accessible (open access) and more reliably harnessed (open data) with the active engagement of all relevant stakeholders (open to society)’ (UNESCO, 2020).

Open science calls for international cooperation in science and technology to achieve a win–win result. The world response to the COVID-19 pandemic is a good example that demonstrates that only by strengthening communication and sharing in the scientific field can we further develop the world economy. Recognizing the importance of open science in today’s socio-economic development, UNESCO (2021) has made an effort to promote open science by providing a ‘UNESCO recommendation on open science’. The recommendation sets international standards for open science.

In this context, the China Association for Science and Technology (CAST) organized a session focusing on dialogue between the world’s top scientists and young scientists during its 23th annual meeting in July 2021. The theme of the session was ‘openness, cooperation and sharing’. Inspired by the views shared by scientists from different countries, and considering the worldwide attention on open science, we have produced six articles exploring the topic of open science, which will be presented in two issues. The current issue includes four contributions from Wei Yang; Dawei Ding and Zhengfeng Li; Yangxu Lu, Yandong Zhao and Huang Lei; and Ke Guan, Danping He and Zhongdui Zhong. Another two contributions, from Ke Gong and from Junmin Wei et al., will be published in the next issue.

In this issue, Professor Wei Yang explores the development of open and inclusive science in China in his article ‘Open and inclusive science: A Chinese perspective’. He analyses the topological and dynamic aspects of open and inclusive science and proposes five major stakeholders in the
generation and communication of scientific knowledge: authors, readers, publishers, librarians and funding agencies. They play different roles in the process of open science, and balancing their gains and duties could help to promote that process. The conversion of scholarly publishing from a subscription model to an open-access (OA) model is a part of open science and should follow the principles of political acceptance; economic viability; transparency and fairness; and wide participation. Yang also analyses the current status of China’s open science based on a series of statistics covering scientific publication, indicating that China is becoming an important partner in the global endeavor of open science. However, there are also barriers for China in promoting the endeavor, such as the low reputation of OA journals, the absence of a national consortium for authors and readers, the gap between the subscription fees in China’s mainland and the average international costs, and the absence of a clear pathway for STM journals’ development in the context of OA publication. Those problems could be solved by establishing a library consortium like CALIS (the China Academic Library and Information System), narrowing the gap between China’s subscription costs and the international average, and finding a development path for STM journals in OA publication.

Dawei Ding and Zhengfeng Li examine the theoretical origin of OA in their article ‘The theoretical origin of the knowledge-sharing mode of open access: From knowledge communism to academic capitalism’. From the perspective of the science–society relationship, the article reviews the historical evolution of science from public-orientation to profit-orientation. Knowledge communism highlights the social functions or the public aspects of science, and thus could be regarded as the theoretical origin of the idea of knowledge sharing. It clarifies the ownership of scientific knowledge, but does not solve the problem of how to get access to that knowledge. Academic capitalism emphasizes both the public and the economic aspects of scientific knowledge. In the context of academic capitalism, publishers that have large databases of scientific publications play an important role in science communication. However, their pursuit of profits through high subscription fees has imposed a heavy financial burden on researchers and research institutions and hindered the communication of scientific knowledge. The OA initiative aims to resist the knowledge monopoly of publishers and promote the opening and sharing of knowledge. Thus, knowledge regains its function as a public good. OA is an expansion and improvement of knowledge communism. It provides a platform for the open evaluation of scientific knowledge and for correcting errors, thus promoting knowledge creation and innovation. The idea of OA has gained popularity in society, accompanied by a questioning of high publishing fees and the perceived low quality of OA journals. More efforts should be made to promote the healthy development of OA.

Yangxu Lu, Yandong Zhao and Huang Lei study Chinese scientists’ engagement in OA in their article ‘Chinese scientists’ awareness of, attitudes to and involvement in open-access publishing’. They analyse Chinese scientists’ views on OA and their participation in OA publishing based on the results of a large-scale survey. Their survey results show that most of the respondents have heard of OA; that there is consensus that OA means to read papers for free; that the internet and journals are the major channels for scientists to learn about OA; and that many scientists have participated in OA publishing. Their survey also suggests that, according to many scientists, wider impact, larger readership and shorter publication times are the most important features of OA journals; most scientists are willing to publish in OA journals, but high publication fees and low quality are the main factors dissuading some from doing so. To solve those problems, the article provides some suggestions for reference in future OA efforts, such as recognizing the strategic importance of OA, establishing a mechanism for information sharing and supporting the development of high-quality OA journals.

Ke Guan, Danping He and Zhangdui Zhong offer a Chinese example of open science infrastructure in their article ‘CloudRT: A Chinese example of open science infrastructure and services’. They use the CloudRT—the world’s first and only OA cloud-native high-performance computing ray-tracing platform—as a case study of open science infrastructure in China, introducing the operational experience of the platform and its impact since its
launch in 2018. It has had a positive influence worldwide, indicating that such a platform could not only help to promote academic communication, talent cultivation and international cooperation, but also promote the development of industries. However, there are many challenges, such as a lack of sufficient financial support, the absence of an organization governing relevant activities of infrastructure construction and the lack of governmental support for the building of an open science infrastructure ecosystem. Future efforts should be made to solve these problems.

Ke Gong shared his views on open science during the Open Science and Open Source Innovation Development Forum held on 7 November 2021 in Beijing. An academic report was produced based on his presentation.

Professor Gong introduced UNESCO’s effort in promoting open science, focusing on the ‘UNESCO recommendation on open science’. He analysed the recommendation in detail and suggested that open science can be understood as a new paradigm of scientific research. Based on such an understanding, he proposed to promote open science in China by forming a culture of academic honesty and sharing, building a mechanism encouraging pioneering exploration, deepening the reform of the scientific research system, using well-designed standards and tools, encouraging public engagement in science and participating in the international open science movement.

Junmin Wei, Jing Li, Xibin Shen and Qihang Tian discuss the use of the open science idea in the medical field in their article ‘Co-construction and sharing of a Chinese medical case repository helps to improve the capacity of clinical doctors’. They first introduce the meaning of open science, thus highlighting the significance of building a medical case repository. They use the database built by the Chinese Medical Association Publishing House as a case study, introducing their experience of building and operating such a platform. The database includes many medical cases from the publishing house’s journals and engages the joint efforts of many medical institutions in China to include more cases in order to increase its value as an OA platform. The full texts of the medical reports on the platform are available for free and can be republished on other platforms, thus enabling the communication of knowledge to wider society and providing a channel for doctors to learn and improve their abilities.

As an irresistible trend in scientific research and a solution for global challenges, open science is attracting worldwide attention. Many researchers have published their views on this global trend. We have produced these six articles about open science in order to share practices in open science in China and by the international community, as well as to inspire more research on this topic. Sharing of studies and practices in open science could promote international exchange and cooperation in both the academic area and the economic area, helping all stakeholders to achieve a win–win situation.

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