Development of open access in China: strategies, practices, challenges

China's rapid growth in scientific R&D in recent years provides solid evidence for the country's innovation-driven development strategy, but also puts increasing demand on open access (OA) to publicly funded research results. This article looks at ways in which the Chinese government, funders, research and library communities are all rising to this challenge, and at future challenges still to be met. As a major scientific publishing country with its estimated 5,000 STM journals, China's place in the international OA publishing scene is considered in detail, with the author concluding that he believes open access to publicly funded research in China will soon become the accepted norm, as all levels of scientific policymakers fulfil their political, professional and international responsibilities, to the benefit of Chinese research and society.

Background

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China has seen rapid growth in scientific R&D in recent years. While this provides solid evidence for the country's innovation-driven development strategy, it also puts increasing demand on open access (OA) to publicly funded research results.

According to the Chinese National Bureau of Statistics[1], the total R&D investment in 2012 reached 1029.4 billion RMB, 18.5% more than in 2011. This includes 560 billion RMB from public funding, 16.7% more than in 2011, and 49.8 billion RMB for basic research, 21.1% more than in 2011. Though the same high rate of growth will be unlikely, continuing strong support for R&D is expected for the foreseeable future as part of China's drive to become an innovative economy.

With this growth in investment, the number of research publications from China has been rising, and their impact has also been quickly increasing. Using data from the Thomson Reuter SCI database, my library calculated that research papers by Chinese authors in international journals increased from 47,927 in 2003 to 186,577 in 2012, with their world share from 5.6% in 2003 to 13.9% in 2012 and the citation share from 3.9% in 2002 to 9.5% in 2012, making it the third most cited country in the world. Internationally co-authored papers have shown the same scale increase of the world share from 5.1% in 2000 to 12.5% in 2010, according to the SCI database.

> "… the third most cited country in the world."

Promotion of open access in China

While acknowledging the challenges involved in attaining higher quality and impact for its research, Chinese funders and research communities recognize that they have a responsibility to enable wider access to innovative research results outside the elite few, and to contribute to the open sharing of research results worldwide. A number of steps have been taken by the central government to aid research organizations in this endeavour.

The Chinese government has been a firm supporter of open access for some time. In 2006, at the CODATA Beijing Conference, Guanghua Xu, Minister of Science and Technology (MoST), announced that China aims to provide open access to scientific data resources

generated and accumulated by national research projects[2]. At the National Innovation Congress 2012, Premier Wen Jiabao made it clear in his speech to the congress that all scientific information created with public funding should be openly accessible as widely as possible to society as a whole to support innovation and development[3]. In November 2013, on behalf of MoST, the National Science and Technology Library (NSTL), as a funding and management arm for information sharing for MoST, officially signed the Memorandum to join the high energy physics (HEP) OA publishing consortium, SCOAP3[4], making China one of the few countries with total governmental funding to participate in SCOAP3.

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Chinese scientific communities have been very active in the promotion of open access. In December 2003, right after the publication of the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities, Prof Yongxiang Lu, President of the Chinese Academy of Sciences (CAS), became the first signatory from China. Then in May 2004, the Natural Science Foundation of China (NSFC) signed the Berlin Declaration. In 2005, CAS organized the first International Conference on Strategies and Policies of Open Access to Scientific Information in Beijing, China, bringing in international experts on open access and domestic research communities for an extensive introduction and discussions on strategies, operational models, implementation policies and best practices in open access. In 2010, the 8th Berlin Open Access Conference – the first one held outside of Europe– was hosted by CAS in Beijing. This conference celebrated the global development of open access and explored the strategies, policies and practices worldwide. One of the highlights of Berlin 8 was the announcement of the Open Access Strategy of CAS. The strategy committed CAS to:

- promote deposit of public research results
- develop OA institutional repositories (IRs) in CAS institutes
- support CAS authors to publish in OA journals
- support transformation to open access of journals published by CAS institutes
- promote and support open access initiatives and policies by research funders
- actively participate in international cooperation in open access.

In 2013, CAS and NSFC joined the participants of the Global Research Council (GRC) to endorse the GRC Action Plan toward Open Access to Publications[5]. CAS and NSFC, together with the Natural Sciences and Engineering Research Council of Canada, will co-host the 3rd GRC Annual Meeting in May 2014 in Beijing, where one of the two themes will be to review the progress in implementing the GRC Open Access Action Plan. CAS will play an active role in organizing the review process.

In addition to these and other formal actions, the Chinese library community has been standing at the forefront of promoting open access. The National Science Library (NSL) of CAS has set up an Open Access Promotion Portal to distribute news, reports and research on OA[6]. A China IR Implementation Group (involving major research libraries) was set up in 2012 to promote the development of IRs in research and academic institutions. The group organized the first China IR Conference[7] in 2013 to scan the domestic field and to enable the exchange of experiences. In 2012 and 2013, NSL organized the 1st and 2nd China OA Weeks[8], with presentations, panel discussions and poster shows on initiatives, policies, best practices and guidelines in OA repositories, OA journals, and related issues. This annual OA Week event is now a recognized focal point in the promotion of open access in China. NSL has set up an Information Policy Centre to support research and the promotion of open access.

"… the Chinese library community has been standing at the forefront of promoting OA."

Development of open access publishing

China is a major scientific publishing country with its estimated 5,000 STM journals. Several surveys were made recently to reveal the extent of open access to these.

According to the survey of Chinese scientific society journals in 2011 by Cheng and her co-authors[9], 308 journals from a total of 820 titles are OA. By discipline, 82 of these are in engineering, 68 in medical sciences/public health, 47 in physical sciences, 27 in biological sciences, 27 in astronomy and earth sciences, and 24 in agricultural sciences. By society, the Chinese Medical Association, Chinese Physical Society, and Chinese Chemical Society are the top three publishers according to the number of OA journals they publish. About half of those OA journals publish open access immediately, while the rest provide delayed open access. The authors found a dramatic growth in the number of OA journals from 140 titles in 2007 to 308 in 2011. They also detected significant advantages in total citations and impact factors for OA journals.

"... significant advantages in total citations and impact factors for OA journals."

Chu and others did an in-depth analysis of these OA journals[10]. Reporting a similar 137% growth in OA journals since 2006, they detailed the timescale to OA: immediate OA is 55.7%; 1–6 month delayed OA is 25.6%; 7–12 month delayed OA is 5%; with longer delays accounting for 12.6%. While all those journals support open access, only 7% formally adopted CC licences. Funding channels are varied, with institutional funds, print subscriptions and fees from aggregators counted as the major sources. Only seven titles charge specifically for OA. As for author self-deposit, 19% formally allowed this, 44.2% did not object, while many had no explicit policy on this yet.

As has already been shown, the number of OA journals in China continues to increase. CAS even set up an OA journal portal to promote its 100+ OA journals[11]. Many research institutions, which are the major publishers or co-publishers for most STM journals, are taking up open access to extend the reach and also, it is hoped, the impact of their journals.
Most OA journals are transformed from print journals, such as *SCIENCE CHINA – Life Science* and *Chinese Science Bulletin*[12], both published by Science Press of CAS and turned open access as part of a collaboration with SpringerOpen in 2011. One example of a born OA journal in China is the *International Journal of Agricultural and Biological Engineering*, started in 2008.

Support for authors to publish in OA journals is somewhat different in China from in many countries. In practice, all research funders in China allow researchers to use research grants for publishing expenses, including article processing charges (APCs) for OA journals. So we have seen an increasing number of OA papers by Chinese researchers appearing in journals from BMC, PLOS and other OA publishers, and even in hybrid OA journals. While this support is expected to continue, concerns are being voiced over predatory journals. New policy studies are under way to provide guidance for authors when selecting OA journals in which to publish.

"… the number of OA journals in China continues to increase."

There are also a few cases of institutional support for publishing in OA journals. CAS, through its NSL, began an institutional membership with BMC in 2010. After a certain discount, NSL will pay 50% of the APC for papers which have a CAS researcher as the first or corresponding author, and the researcher will pay the rest. We have seen a steady increase in submissions and publications by CAS authors since then. NSL has also been discussing similar co-operation with other OA publishers with an established record of quality control and transparent pricing. As mentioned, another important step was China's joining SCOAP3. CAS led this process by formally signing the Expression of Interest to join SCOAP3 in 2012. The High Energy Physics Section of the Chinese Physical Society worked together with the China SCOAP3 Group, made up of libraries from HEP research-intensive organizations, to promote SCOAP3 and negotiate deductions with publishers. The combined forces succeeded in securing the MoST's full coverage of China's share of SCOAP3 funding.

Development of open access repositories

One of the major open access pushes in China has been in the area of institutional repositories. The first large-scale development started with the CAS IR, Grid, in 2009. Not aiming to be a 'passive' repository but an institutional knowledge management and knowledge service platform, CAS has deployed IRs in its 103 research institutes[13]. By the end of 2013, more than 400,000 full-text research papers had been deposited[14], and these have accumulated 14 million downloads, of which 7 million were in 2013 alone. In addition, functions such as automatic author profiling, institutional knowledge mapping and linked search with third-party resources have become standard services for all CAS IRs. In 2013, NSL openly issued certificates for the '20 Most Downloaded Papers CAS-wide', to provide evidence for the impact of its IRs and to reward the most influential authors through IRs. (Each of the papers gaining certificates had been downloaded more than 300 times.) Now in the international registries like DOAR and ROAR, CAS IRs count for more than two thirds of Chinese IRs. CAS, through the NSL, took an integrated approach with free IR platform software, a support structure with technical, implementation assistance and policy teams, backed up by frequent training and consultation enhanced with an online support forum. At the same time, NSL developed detailed policy guidelines[15] on the rights of all stakeholders in the deposit and distribution of publicly funded research results, in order to provide CAS institutes with a clear understanding of the rights, permissions and restraints in the services of IRs.

> "… more than 400,000 full-text research papers … have accumulated 14 million downloads …"

Xiamen University Library was the first of the university libraries to develop an IR, but other academic libraries in mainland China have been catching up fast. CALIS, the academic library consortium, started its IR Initiative[16] in 2011, growing from five universities in the beginning to 28 by November 2013. IRs in the Hong Kong[17] and Taiwan[18] areas have also covered most of the major academic institutions in their respective regions.

In September 2013, the first Chinese IR Conference, titled 'Good Practices for Institutional Repositories', was held successfully, with 34 presentations given. It was co-organized by the China Institutional Repository Implementation Group (CIRIG), Special Libraries Branch, Library Society of China (SL/LSC), Academic Libraries Branch, Library Society of China (AL/LSC) and NSL. More than 200 IR researchers and practitioners from across China participated, including some from Taiwan and Hong Kong. At the Conference, CIRIG reported on its surveys on the development of IRs in China and on the researchers' awareness of and needs for IRs. Other presentations focused on IR services models, development strategies, rights management policies, services for non-textual materials, interoperability standards, measures to stimulate and award user deposit, criteria and methods to evaluate IR, among others. The broad coverage of topics gave testimony to the rapid growth of IRs in China, with the expectation of an even stronger and richer development of IRs there in the future.

Challenges to open access in China

> "… there is support for OA from governmental, public and research communities …"

Though there are still some people with misgivings about OA, there is support for open access from governmental, public and research communities who have a strong commitment to it and a desire to see things happening in this area. Government agencies and major research organizations, such as MoST, CAS, NSFC, are all currently working on detailed OA policies, and it is expected that high-level policies with far reaching impact could come into force soon.

It now seems that 'green' OA, author self-deposit of papers from publicly funded projects, will be the policy focus because of clear policy examples from NIH and many other funders, and successful experiences with CAS and universities. Support for IR development will be extended, while the institutions that already have IRs will explore services with non-textual materials and more in-depth knowledge analysis.

As for 'gold' OA, support for OA APCs through authors' R&D funding will continue, but institutional payments of APCs to OA publishers can be slow to realize, due to concerns over predatory behaviours and cost transparency. However, the transformation of domestic STM journals into open access is going strong, with encouragement and all kinds of support from the publishing institutes. We expect to see a bigger share of OA journals domestically and more Chinese OA papers internationally.

The current challenges are still the need for stronger involvement of research communities, and for formal operational policies and implementation support from funding agencies. Now that CAS and NFSC have already endorsed the GRC Action Plan toward Open Access to Publications, actions have to follow, not only to further the OA practices that have already met with great success, but also to back up their international commitment. Discussions on the policy details are getting lively, with topics including embargo periods and enforcement of funder mandates in green OA, selection criteria and APC sharing schemes in supporting gold OA, and effective ways to transform domestic journals into OA ones. One further issue – very important but yet to be addressed by the funding agencies and libraries – is whether and how to promote and organize transition of library acquisition budgets into open access funds.

This author is confident that, as China takes the innovation-driven development strategy, open access to publicly funded research in China will soon become the accepted norm, as all levels of scientific policymakers fulfil their political, professional and international responsibilities. Chinese research and society will benefit most from it.

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