Short communication not peer reviewed

International disparities in open access practices of the Earth Sciences community

Olivier Pourret[1], David W. Hedding[2], Dasapta Erwin Irawan[3], Haiyan Liu[4], Jonathan P. Tennant[5]

[1]UniLaSalle, AGHYLE, 19 rue Pierre Waguet, Beauvais, France

[2]Department of Geography, University of South Africa, Private Bag X6, Florida 1710, South Africa

[3]Faculty of Earth Sciences and Technology, Institut Teknologi Bandung, Bandung, Indonesia

[4]School of Water Resources and Environmental Engineering, East China University of Technology, Nanchang 330013, PR China

[5]Institute for Globally Distributed Open Research and Education, Indonesia

Scientific publication is slowly, but surely, transforming into the digital age. A decline in printed paper editions, high costs of journal subscriptions, and increasing publication costs are all spurring scientists to look for alternative outlets to traditional scientific publishing. One such alternative is publishing via Open Access (OA) which aims to make scientific content more accessible online, and has been around in various forms for almost 3 decades. Where authors consider submitting a research paper is dependent on a number of factors (Sharman, 2015): Journal Impact Factor (JIF), indexing status, readership, type of journal (scholarly vs popular magazine), language, type of article (regular vs review vs commentary), peer review speed and status, Article Processing Charges (APCs) or additional publication charges. The list goes on.

In this opinion, we briefly discuss key differences in publication strategies between earth scientists from around the world. Together, the five authors have worked in six different countries as researchers (*i.e.* China, Denmark, France, Indonesia, South Africa, and the UK), and so have a breadth of experience, and also cover a broad spectrum of Earth Sciences (*i.e.* hydrogeology, geochemistry, geomorphology, and palaeontology). Collectively, we have also extensively engaged a range of international communities about scholarly publishing through mainstream media, peer reviewed research journals, workshops, seminars, and in a range of advisory capacities. We discuss differences in our experiences and understanding of financial pressures (OA vs paywall), quality (predatory journals), geographical extent (regional vs international), and authoring language. Note that only two of the authors are native-English speakers.

Every paper has its own unique audience. Some papers go to journals like *Science* or *Nature*, while others go to the *South African Journal of Science* or the *Journal of Asian Earth Science*, and there

are usually valid reasons for choosing either. Some papers may be discipline-specific or multi-disciplinary, while others have a local or regional focus or global significance. For example, a research paper on the hydrogeology of a small tectonic region in Indonesia is unlikely to demand an audience from most other parts of the world, and will be of more functional use to those it directly impacts. Some papers are purely theoretical while others are more applied and will have tangible benefits for society, culture, or the economy. Others might have little or no practical use whatsoever, but remain valuable assets nonetheless in our constant quest for knowledge. Originally, scholarly journals as the primary vehicle for communicating this work to other researchers and the wider public were run by various societies and associations (Fyfe et al., 2017). Some journals have remained independently-run by scholarly communities, while some commercial publication houses slowly enveloped most journals (Larivière et al., 2015).

Unfortunately, according to the STM Report 2018 (Johnson et al., 2018), two-thirds of the scholarly literature produced in 2016 remains mostly inaccessible because the work is hidden behind prohibitively expensive subscription paywalls. Now, scholarly publishing is currently undergoing a major transformation with the ever-increasing move to OA, which, while generally slow, marks a significant shift in major publishers' financial models., within an STM information publishing market that generated US $25.7 billion in 2017. Consequently, this has opened up greater diversity in publishing routes, and highlighted major issues around publishing ethics, including around copyright and the [in]appropriate expenditure of public funds. Ensuring that researchers as authors and their institutions do not have to pay even more to read and publish papers than they currently do has become a critically important part of the OA transition (Tennant et al., 2016). This brief history is important when one considers that the ultimate aim of publishing research is to disseminate information and describe advances in science which benefit society,

especially now in the increasingly important context of the United Nations Sustainable Development Goals (Pourret, 2020).

The typical scholarly publication routes are illustrated in Figure 1. While many authors seem to equate OA with a specific form of business model (APC-driven gold), this is clearly erroneous and a myth that needs to fade.

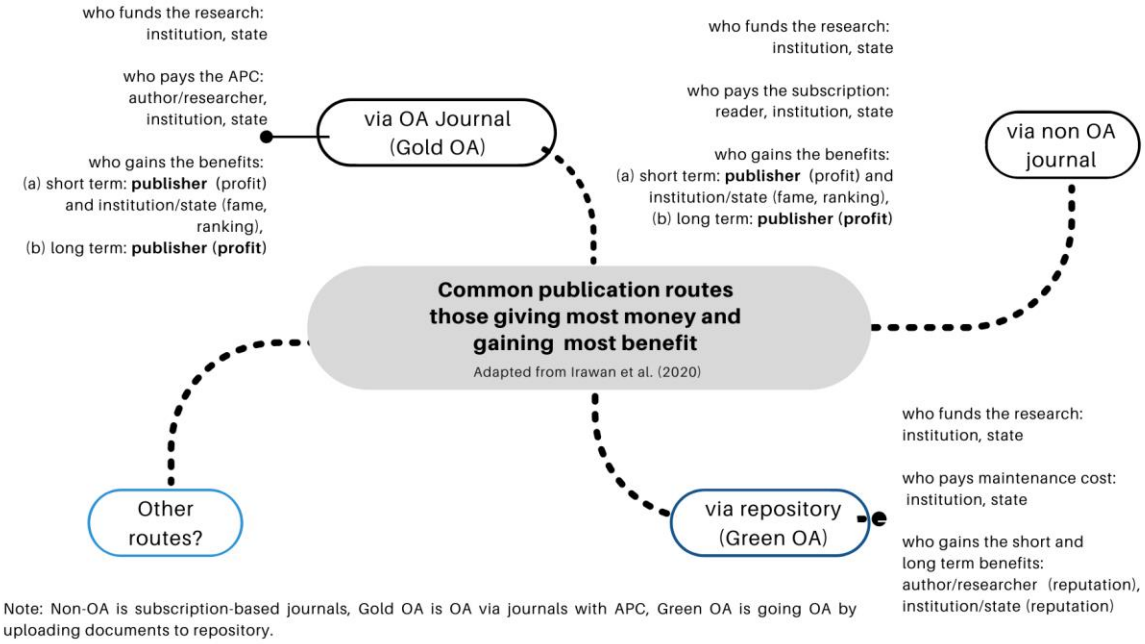

Figure 1 The academic publication route: a schematic representation of different OA decision steps highlighting financial burden and benefit/reward for different stakeholders (adapted from Irawan et al., 2020).

From the distribution of articles and proportion of OA articles published in 2018 indexed in the Web of Science categories “Geochemistry and Geophysics” and “Geology” and the Scopus category “Earth and Planetary Sciences” by countries (Table 1), we can see that 24-31% of all

articles are available as OA in some countries (*i.e.* England/UK and France) and some other countries seem to contribute a much lesser proportion (*i.e.* China, Indonesia, and South Africa).

Table 1 Number of articles published in 2018, of OA articles and proportion of OA articles indexed in Web of Science categories "Geochemistry and Geophysics" and "Geology", and Scopus category "Earth and Planetary Sciences" alphabetically ordered by countries (data accessed on 02/26/2020).

	"Geochemistry and Geophysics" WoS category			"Geology" WoS category		
	Total number of articles	Number of OA articles	Proportion of OA articles	Number of articles	Number of OA articles	Proportion of OA articles
Total	13436	3271	24	30189	9369	31
China	3492	651	19	7277	1295	18
England	1063	574	54	2545	1618	64
France	1145	333	29	2085	851	41
Indonesia	26	6	23	173	91	53
South Africa	134	26	19	415	81	20
USA	3569	902	25	6761	2523	37

	"Earth and Planetary Sciences" Scopus category		
	Number of articles	Number of OA articles	Proportion of OA articles
Total	106241	33135	31
China	30877	6321	20
England /UK	9749	4516	46
France	6949	2916	42
Indonesia	561	254	45
South Africa	1466	538	37
USA	25108	11486	46

Open Access policy

The majority of Earth Sciences knowledge production from China is published in hybrid journals. This trend can be attributed to a historical national incentive for researchers to publish in high JIF journals (*i.e.*, those that publish the least reliable work; Brembs, 2018). In many cases, one of the only options for authors is to publish their research in a "high impact" journal without paying the APC and place their paper behind a paywall. However, this policy changed dramatically in early 2020. China has just published a national-level policy to ban the use of journal-based metrics as assessment criteria for academic promotion and recruitment, which, however, should give priority to the innovation of one's work and significance of representative achievements in solving

practical problems (Mallapaty, 2020). We regard this as a responsible first-step for research evaluation reform, and encourage other nations to adopt similar policies that are more rigorous and scientific. Specifically, the new policy tackles perverse incentives that drive the "publish or perish" culture that might be encouraging questionable research practices . Albeit, there will probably be more research being published in Chinese national journals (*e.g.*, *Acta Petrologica Sinica*, *Geology in China*), the majority of which have page charges and are fully OA by default.

Pourret et al. (2020b) highlighted that publicly-funded research in the UK has to be made available OA in order to abide by the UK Research and Innovation policy. UK research councils provide universities with a tranche of money specifically dedicated to cover costs of gold OA publishing through APCs. Each university then uses that pot of money how they see fit: some cover gold OA costs for publications by their staff on a first come, first served basis, while others favor publications they believe will have a higher impact. Any publication not selected for gold OA (*e.g.*, because it was not deemed impactful enough, or because the money has run out) has to be deposited green OA at no charge to authors, and there is a general policy for self-archiving in order for works to be eligible for assessment in the UK's Research Excellence Framework. Some universities also have restrictions on publishing in hybrid journals, due to their lower quality standards and relatively higher costs. Currently JISC (https://www.jisc.ac.uk) is negotiating national-level agreements with commercial publishers. These contracts involve donating millions of pounds each year of public money to sustain the dysfunctional commercial publishing sector. They do this while simultaneously neglecting to invest in a more sustainable open scholarly infrastructure, and thus while often termed "transformative agreements", we believe a more accurate term could be "stagnation agreements". This situation is being replicated by many countries around the world,

as they try to realign themselves with recent changes implied by Plan S (Tennant, 2020). Other countries such as Denmark are having considerably more success by investing through libraries into 'green' OA as part of their national policy (Pourret et al., 2020a). Indonesia recently became the world leader for Open Access, thanks largely to efforts to index their journals in the Crossref registry (Van Noorden, 2019).

Global inequalities

Virtually everyone who might benefit from access to research has limited access to papers kept behind paywalls. For many countries, Hedding (2020) highlighted that it is extremely expensive for university libraries and non-academics to pay to access published scientific content; a problem that is even greater for less-financially developed nations. OA may conceptually address these negatives by opening up access, but it often simply shifts the financial burden to the researcher-side (Figure 1). Shifting towards OA creates inequalities between countries that have substantial financial resources and those that might have more difficulty to pay APCs (often high). That some countries have allowed the scholarly publishing system to essentially become a public financing machine for this inequity is quite the phenomenon, and indicates a horrendous mismanagement of relevant publishing funding streams, failure to understand even basic market principles, and the compromising of public interests to protect those of the commercial sector. However, as recalled by Pourret et al. (2020a), Indonesia has more than 1571 OA journals (ranked second after the UK in the DOAJ database; https://doaj.org/). The majority of these journals do not have APCs (70%; Irawan et al., 2018) are funded by local universities and research institutions and published locally. Those journals listed in the DOAJ are mostly publishing English-language articles but only

represent one-sixth of the Indonesian journals listed in the GARUDA database (http://garuda.ristekdikti.go.id/). Journals which charge a moderate APC are mostly the ones that have been indexed by indexing services (e.g., *Indonesian Journal On Geoscience*), and are considered to be of higher value as a result. However, even indexing services such as Scopus have been infiltrated by predatory journals (https://idea-en.cerge-ei.cz/news/46-predatory-journals-in-scopus) which continue to inflict a number of skepticism on scholarship systems. The regulation of Indonesia's higher education system gives a higher score to articles published in journals and conference proceedings listed in Scopus, of which only 47 Indonesian journals are currently listed. Those journals are now considered to be the elite journals in Indonesia. This means that, in the future, we might see the start of a correlation between APC and the scientific scoring system in Indonesia, and the possibility exists that other Asian countries may follow suit. Either way, we feel that it is important to note here the perplexing scenario in which the current Indonesian evaluation system seems explicitly designed to penalise Indonesian researchers who share and publish their work in the Indonesian language and Indonesian journals.

Although from a different perspective, the push for decolonization of research in South Africa has raised similar concerns (Breetzke and Hedding, 2019). Some South African researchers bemoan the lack of credit for publishing in local African journals. This is even more true in other African countries (*e.g.*, Democratic Republic of Congo). “OA voices from the Global South [...] have shown that their OA systems can be successful without capitulating to corporate publishers or expecting authors to pay publishing fees." (Scherlen, 2020). Thus, although African researchers should place more emphasis on publishing in local African journals, the potential threat of predatory journals for African research communities is relatively high (Mouton and Valentine,

2017). So, although a need exists for African researchers to publish locally, this should be done while maintaining quality; which is the same problem as much of the rest of the world faces. To compound the problem in the case of the Earth Sciences community in Africa, very few local journals focus on earth sciences (e.g., *Journal of African Earth Science*, which is published by Elsevier and the OA options are virtually unaffordable for African researchers).

To conclude, while bearing in mind the major disparities described above, the most important thing is to get your science out there and maximize its impact. We thus call for greater unification of the global Earth Sciences community to focus on non-profit and community-driven solutions for OA publishing and open science (*e.g.,* EarthArXiv). It is time to return the sovereignty of research on Earth Systems to those who perform it and those who need it.

References

Breetzke, G.D., Hedding, D.W. (2019) The changing and challenging research landscape in South Africa. Studies in Higher Education, 1-15. DOI: 10.1080/03075079.2019.1602758

Brembs, B. (2018) Prestigious Science Journals Struggle to Reach Even Average Reliability. Frontiers in Human Neuroscience 12.

Fyfe, A., Coate, K., Curry, S., Lawson, S., Moxham, N., Røstvik, C.M. (2017) Untangling Academic Publishing: A history of the relationship between commercial interests, academic prestige and the circulation of research. Zenodo. http://doi.org/10.5281/zenodo.546100

Hedding, D.W. (2020) Comments on “Factors affecting global flow of scientific knowledge in environmental sciences” by Sonne et al. (2020). Science of the Total Environment, 135933.

Irawan, D.E., J. Abraham, M.T. Multazam, C.N. Rachmi, I. Mulyaningsih, S. Viridi, R.R. Mukti, M. Djamal, D.J. Puradimaja (2018) Era baru publikasi di Indonesia: status jurnal open access di Directory of Open Access Journal (DOAJ). Berkala Ilmu Perpustakaan dan Informasi, 14, 133-147 (in Indonesian).

Irawan, D.E., Abraham, J., Kiramang, K. (2020) Scientific publication routes in Indonesia https://eprints.itb.ac.id/76/

Johnson, R., Watkinson, A., Mabe, M. (2018) The STM Report: An Overview of Scientific and Scholarly Publishing. 5th edition. International Association of Scientific, Technical and Medical Publishers, The Netherlands, 214 pp.

Larivière, V., Haustein, S., Mongeon, P. (2015) The Oligopoly of Academic Publishers in the Digital Era. Plos One 10, e0127502.

Mallapaty, S. (2020) China bans cash rewards for publishing papers. Nature 579, 18.

Mouton, J., Valentine, A. (2017) The extent of South African authored articles in predatory journals. South African Journal of Science 113.

Pourret, O. (2020) Global Flow of Scholarly Publishing And Open Access. Elements 16, 6-7.

Pourret, O., Irawan, D.E., Tennant, J.P., Wien, C., Dorch, B.F. (2020a) Comments on "Factors affecting global flow of scientific knowledge in environmental sciences" by Sonne et al. (2020). Science of the Total Environment, 136454.

Pourret, O., Hursthouse, A., Irawan, D.E., Johannesson, K., Liu, H., Poujol, M., Tartèse, R., van Hullebusch, E.D., Wiche, O. (2020b) Open Access publishing practice in geochemistry: overview of current state and look to the future. Heliyon 6, e03551.

Scherlen, A. (2020) Building Bridges for Social Justice in Global Publishing: Seeking the Mexican Perspective. The Serials Librarian, 1-5.

Sharman, A. (2015) Where to publish. Annals of the Royal College of Surgeons of England 97, 329-332.

Tennant, J. (2020) How can we achieve a fully open future? SocArXiv https://doi.org/10.31235/osf.io/9kjwp

Tennant, J., Waldner, F., Jacques, D., Masuzzo, P., Collister, L., Hartgerink, C. (2016) The academic, economic and societal impacts of Open Access: an evidence-based review. F1000Research 5.

Van Noorden, R. (2019) Indonesia tops open-access publishing charts. Nature doi: 10.1038/d41586-019-01536-5