Open Science: What's not to like?

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1. Open Science and digital genres

Open Science, enabled and abetted by digital genres, is the new academic buzzword. Credited by institutions, funders and governments to be the best thing to happen to scholarship since the printing press, it promises to bring greater transparency, efficiency, reproducibility, accessibility and collaboration to research. While there are various definitions of the term, the basic principle can't be seriously disputed: that scientific knowledge results from social collaboration and belongs to the wider social community, while its outputs are a public good that everyone should be able to use at no cost. These ideas are not new and go back to the origins of modern science in the 16th century, but new communication technologies and digital genres have helped push them closer to reality. However, while accompanied by gushingly positive endorsements, Open Science does not always sit comfortably with other aspects of university life and, to some extent, is an ideology which is attended by a certain amount of optimism - even hype. In this short opinion piece I just want to pause the parade for a moment and raise a few questions that puzzle me about all this. Others better informed than me might be able to provide answers.

First, what is it? The term "Open Science" actually refers to a number of different practices, all intended to remove financial, geographical and social barriers to make research and its dissemination fairer and more accessible. Most obviously by:

- facilitating the sharing of data and expertise among academics in different institutions, countries and disciplines, thus increasing collaboration and coauthorship.
- allowing review of research by the wider community along with reviewers and authors who are aware of each other's identities.

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- making publicly funded research more widely available by removing journal paywalls through Creative Commons licences and Open Access publication models.

Clearly, all this depends on digital technologies and, more centrally, the inescapable dominance of the internet.

2. Digital frills?

For academics, researchers have been able to exploit the affordances of the internet to collaborate with peers and gain greater visibility for their work while we, as applied linguists, are overjoyed to find new genres to analyse. Discourse analysts in particular have been quick to take up the challenge of describing new kinds of texts and what they mean to writers and knowledge creation. Most obviously, digitisation has allowed corpus analysis to flourish. My PhD submitted in 1995, for example, comprised 16 research articles, photocopied in an hour in the university library. Today analysts scoff at anything under 5 million words and Mark Davies' NOW corpus (News on the Web) contains 15.7 billion words and grows at 200 million words each month[1]. While impressive, this isn't an unalloyed delight, of course, as we don't (yet) have the means to analyse this mass of words in any meaningful way. Data doesn't equal knowledge and getting meaning from it is like the Medieval problem of counting how many angels fit on a pin head.

Overall, though, I think we're happy to get our hands on more texts and more genres, so that analyses of blogs, homepages and PowerPoint slides have become staples of the EAP industry. But while some of these genres are genuinely novel, many are old wine in new bottles. The research article, for example, remains the cornerstone of knowledge creation and its migration to the web seems to have been accompanied with only minor changes. The technical affordances of the medium such as multimedia and hyperlinks are available but seem to be exceptions rather than integral for the majority of authors. So is this really a 'digital genre' or a paper genre in disguise? Rowley-Jolivet and Campagna (2011) call this a 'replicated genre', to be contrasted with genuinely 'web-native' genres which the medium makes possible, such as video abstracts, blogs, academic homepages and social networking sites like *Mendeley* and *Academia.edu*.

So 'digital genres' are often not digital at all, except in the trivial sense of being online. Other genres contributing to the 'Open Science' project, such as those facilitating data and idea sharing such as pre-prints and online lab notes, also had their counterparts in pre-digital times and the same applies to channels disseminating popular science (e.g., Hyland, 2009). This is not to say there have been no gains from these emergent genres. Enhanced visual and editing features, together with the greater possibilities for response which these genres offer, bring huge advantages to readers and writers, while applied linguists have enormous fun describing their characteristics and differences. But overall, and unless I've missed something, it is not the 'digital' characteristics of these genres which are key to knowledge creation and persuasion, but their presence on the web. Their importance to creators and users lies in the fact they are instantly available to millions of different populations—stakeholders, peers, funders, students, practitioners, promotion committees and the general public. This is a tremendous advantage to those eager to understand issues, make discoveries and then distribute their interpretations to the widest audience they can. But in the end, is it just traditional practices on a bigger scale?

3. Open Science: is it really?

Moreover, in our enthusiasm for Open Science and the bountiful gifts it brings to research and academics, I wonder if we may have lost sight of some of the problems that have accompanied it, and which it has contributed to bringing about. I will focus on the main aspect for which Open Science is most often celebrated, how it offers greater collaboration.

a) Collaboration

Web 2.0 platforms make it easier for academics to share ideas, data and expertise with scholars across the world, facilitating a massive growth of international cooperation. This is obviously a 'good thing'. Working with others can cut our workloads, provide access to more varied data and fill-in the gaps in our knowledge and skills. For disciplines which require huge, expensive infrastructure which no single country can afford alone, such as particle physics, international collaboration is a no brainer. So there is no doubt that Open Science has made a significant contribution to pushing knowledge frontiers by assisting researchers to work across boundaries. The

free availability of collaborative writing platforms such as *Google Docs* or online tools like *Authorea* and *Overleaf* facilitate co-authorship at all levels.

But despite pressures by funding bodies, the attraction of interdisciplinary work and the necessity to share resources, practices and attitudes to it differ widely. While "Big Science" research can involve a hundred people spread across institutions and countries, for those of us working in Arts, Social Science and Humanities, authorship can be a solitary and unsociable business and tends to involve a greater diversity of research which can create difficulties in finding like-minded others to work with. Strong electronic working relations seem to develop out of face-to-face contacts (e.g., Newman, 2001) and there is some evidence that collaborations with fewer universities or which bring distant researchers together physically appear to be better coordinated and produce more positive outcomes than projects involving multiple universities (Cummings & Kiesler, 2005).

Some mammoth collaborations, in fact, have been criticized for their constricting procedures and regimentation, as 'Big Science' replaces the creativity of the lab with the bureaucracy of large corporations (Krige, 1993, p. 254). Chompalov et al. (2002), for example, found that most collaborations operate a "hierarchy within consensus" with clear leaders and followers. While work practices are often organized into consensual groupings at a micro level, "the more integrated a collaboration's data acquisition, the less meaningful are the independent interests of the members" (Chompalov et al., 2002, p. 765). This may be particularly depressing for researchers in *interdisciplinary* projects, which involve considerable integration between different disciplines, as opposed to *multidisciplinary* research, where each discipline uses its own disciplinary lens.

The challenges of bringing together multiple disciplines and, therefore, multiple ways of knowing and conducting research, means that genuinely interdisciplinary research is often difficult to carry out. Different perspectives on research and reality can impede communication across disciplines (e.g., Aram, 2004) and sometimes generate disciplinary chauvinism (Klein, 2005). Perhaps the most serious obstacles are differences in paradigm assumptions, illustrated most starkly between positivist views of a knowable external reality and constructivist beliefs that realities exist only in the mental representations of individuals (e.g., Guba & Lincoln, 1994). In a study of 25 academics involved in an interdisciplinary project related to sustainability, for example, Gardner (2013) found that the social scientists

involved in the research expressed concern about a disciplinary hierarchy and felt their contribution to the project was not valued by the hard scientists. Miller et al. (2008, p. 46) argue that such divisions are common and observe that "[m]ost interdisciplinary research ends up entitling a single discipline or epistemology, incorporating others in a support or service role—we can refer to this as 'epistemological sovereignty'". Such problems are not created by Open Science, of course, but we need to make it work in a more egalitarian way.

One area worth celebrating is how Open Science collaborations have often succeeded in supporting the publishing efforts of academics outside the metropolitan centres of research. So Outer Circle academics appear to be benefitting from the insider know-how of international coauthors by getting their work published and noticed. Globally, 24% of all articles had international co-authors in 2016 (National Science Board, 2018), and half of the papers in ISI-indexed papers with an African-affiliated author are co-authored with partners from outside the continent. But collaboration does not necessarily mean equal participation as in North-South collaborations it is the Northern partner which usually controls the project resources and it is easier for them to establish priorities (Albornoz et al., 2019).

More fundamentally, issues and contexts are typically framed to appeal to Western gatekeepers and readers. In arts and social science fields emphasis is on participants as universal *actors* and their local context unreflectively treated as a global context. Studies carry assumptions which privilege Western actors and contexts while studies conducted in other locales must disguise their specificity and focus on universally relevant issues. An ideology of global collaboration in the pursuit of knowledge, the ideal which underpins Enlightenment science, thus masks the importance of location while simultaneously shaping the evaluation practices of gatekeepers (Hyland, 2015). Again, Open Science does not create these problems but is unable to resolve what it facilitates.

It is also worth underscoring that most international collaborations are conducted by G7 countries, with 39% of all internationally collaborative papers including at least one US-based co-author (National Science Board, 2018) and the UK, France and Germany all with levels of international co-authorship at around 50% of papers (Elsevier, 2017). Moreover, data show that about 85% of US and UK international collaboration are with only one or two partners, usually among other "leading" research economies (Adams

& Gurney, 2018). There seems, in fact, to be increasingly intense levels of interactions between leading research groups forming around a core of 14 countries with strong national systems (Leydesdorff & Wagner, 2008). This dominance of the core is strengthened by the Web 2.0 platforms which underpin Open Science, so while it may make it easier for academics to share ideas, data and expertise with scholars across the world, this works best for those already plugged into key networks and outsiders may be increasingly excluded (Luzón & Pérez-Llantada, 2022). Disadvantage arises from lack of access to the most intense knowledge environments and the high-quality work that they create.

b) Review and access

While collaboration may be the main feature of Open Science, it is not the only one and observers point to the advantages of open peer review and open access. Both are laudable endeavours, but again, both fall short of their goals. *The British Medical Journal* has used Open Peer Review for 20 years and all PLOS journals now offer authors the option to publish their peer review history alongside their accepted manuscript together with all associated texts. *Nature* and *PLOS Medicine*, however, have had problems with higher refusal rates, increased delays and non-engagement of authors and reviewers (Lee et al., 2013). Nor has post-publication review been taken up extensively. With the Web of Science database now containing 171 million papers, and more than 3 million new peer reviewed articles appearing each year (Johnson et al., 2018) it is hard to know where these extra, unpaid reviewers will come from. Just one publisher, Elsevier, made use of 700,000 peer reviewers in 2015 alone to conduct 1.8 million reviews (Reller, 2016) and with the population of researchers growing and the pool of potential reviewers shrinking (Hyland, 2020), the system needs a more radical rethink than open review tweaks.

Open Access (OA) is perhaps the greatest success story of the Open Science movement. The absurdity of academics and taxpayers forced to pay to read publicly funded research while large publishers see profit margins of 35% or more had to be addressed. It is true that publishers play a key mediating role in the publication process, investing over £2 billion to migrate their industry from paper to web delivery and adding value by creating sophisticated systems to support submission, peer review, search tagging and dissemination. Because the internet radically reduces the technical costs of access to information, it allows the full text of articles to be freely available

to users through Green OA, where authors can deposit their papers on their own websites or institutional repositories for free access.

OA is gaining massive traction with a recent study estimating that at least 28% of the scholarly literature is now OA (19m papers in total) and that this proportion is growing. However, while we tend to think of Open Access as free to read research through 'Green' OA, whereby authors self-archive their articles in open repositories, this growth is driven mainly by Gold and Hybrid types (Piwowar et al., 2018). These are business models where authors are charged a substantial Article Processing Charge (APC) of several thousand pounds to publish their accepted papers in either fully OA journals or subscription journals with an OA option. In other words, while OA is providing greater access to the literature, perhaps leading to higher citations and downloads for its authors (Langham-Putrow, 2021), it is writer-pay models which dominate the market. This is perhaps because of the more effective search tools available by the large publishers, but it means that researchers without the funding necessary to publish in this way are potentially excluded, or at least restricted, from participating in this Brave New World.

4. Some final thoughts

As I finish this brief paper I wonder if I have come across as a kind of modern-day Luddite, opposed to technology and changing practices. To put the record straight, I have set out to think my way through some of the darker corners of Open Science and raise some less triumphal aspects of how it has developed. Without doubt, Open Science is the product of good intentions: to widen participation in, and understanding of, research; but it also carries serious risks of aggravating already unequal power relationships in the academic world. There is potential in Open Science practices, already apparent, of hardening networks among the research elite which may further marginalize those institutions and countries that are not part of it while strengthening the hierarchies which exist between disciplines and journals. Scholarship is not best served by nurturing subservient relationships and endangering local knowledge.

Clearly academic life has changed rapidly, and continues to do so, with greater numbers of co-authors (papers on the large Hadron Collider have 3,800 authors), greater access, more researchers, more journals, more papers

and more of everything. It is thought that there may be over eight million scholars working in 17,000 universities seeking to publish in some 33,100 scholarly peer-reviewed English-language journals each year (Johnson et al., 2018). The production of papers is also on an industrial scale, with more than 3 million new peer reviewed articles published each year and doubling every nine years (Johnson et al., 2018). When the US$ 3 billion scientific book market is added to this, and the growing volumes of poor-quality research published in predatory (or fake) journals, we can see that academic publishing is a significant social and financial force. None of this would be possible, of course, without Web 2.0 and Open Science.

We might think this is a good thing—and indeed it is. No doubt greater and more disparate participants bring novel contexts and new ideas to the table. But the digital technologies that make this possible have also turned round to bite us. There is a reciprocal relationship between technology and culture as innovations are created to meet the needs of a society, but once developed they alter the behaviours and operations of that society. We have to read more now, for example, or at least pretend to. So reference lists have grown longer, with a study of 30 disciplines in the Web of Science averaging 29 per paper in 2003 and 45 in 2019, with no sign of levelling off (Dai et al., 2021). More seriously, the tools which allow us to create, access and distribute our work also enable others to assess it, producing a relentless and unforgiving numerically-driven assessment culture. We must not only produce research but also place it in the right journals and get it cited, then popularize it on blogs, tweets and websites, and show it has real world impact.

It is also worth asking, I think, whether all this publishing is an abundance of riches or a tsunami of dross? I'm not really able to answer this, but it certainly seems that the supply of published work may be increasing while the demand for it is falling. Web of Science records suggest that fewer than 10% of scientific articles are likely to remain uncited, although this is up to 24% in engineering and technology (van Noorden, 2017). But only the most prestigious work is indexed in the ISI databases and the true figure is probably much higher, with a great deal of published research sinking without trace. The motivation, or necessity, to publish is now a career imperative and academics are encouraged to pad out their CVs with pointless papers and doubtless I am as guilty of this as anyone.

The most central problem, it seems to me, however, is a contradiction at the heart of the academic project. An altruistic ideology of transparency,

fairness and widening involvement does not sit comfortably with a system which promotes and rewards academic individualism and corporate profit while buttressing the privileged position of the Anglophone centre. Academic work does not, sadly, always live up to the cultural stereotype of a rational, asocial and collaborative enterprise where individuals always act in the interests of science rather than themselves. But perhaps it is too much to ask that Open Science can change everything at once and a great deal has been achieved in fostering greater collaboration and free access. This is an exciting beginning, but we should not see it as the end of the story.

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[1] https://www.english-corpora.org/now/