Open: evolution and revolution in science

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The first academic journal was created by Henry Oldenburg (1619--1677), first Secretary of the Royal Society. Rather than wait years for scientists to publish their findings in books, Oldenburg wanted to accelerate the scientific process by soliciting short letters from scientists. He collected these letters and published them as the first journal, Philosophical Transactions of the Royal Society, in 1665. He encouraged submissions from all who had knowledge to share, even people without formal training, and he encouraged the use of common language (as opposed to Latin, which was previously used for scientific communication) so the content could be accessible to a wider audience (see Science as an Open Enterprise, Royal Society Report).

Journals were created to be an engine of science, driving innovation, communication, and openness for the benefit of all. After 350 years however, these systems have developed into something else entirely, and reached their limits. In many ways traditional journals are now barriers to progress in science (and even antithetical to their original purpose - as powerfully illustrated by the late Aaron Swartz in his Guerilla Open Access Manifesto). Perhaps the only thing they truly do effectively now is generate profits.

In the context of increasing pressures in science e.g. from sheer research volume, traditional publications and peer-review have long-since reached the point of diminishing returns. New paradigms of transparency and collaboration in the peer process which go beyond 'review' are needed, and systems of rapid open access to text, data, and code are essential. Solutions are already developing, such as FigShare and ScienceOpen.

Today, there are many possibilities for publishing your scholarly work. For authors, this means that the hurdles to passing through various publication systems ranges enormously, from closed, anonymous, peer-review; self-publishing on pre-pub archives (such as ArXiV); or even simply paying a so-called predatory-publisher.

There are most definitely still reputable journals. There are also good reviewers who freely volunteer their time and energy to the enormous financial gain of publishers, which charge for publicly-funded research at every turn (see here for a nice graphic explaining the publishers business mode). But, the benefits of peer-review and the dissemination enabled by journals can be received (and greatly improved upon) outside of a traditional system. Indeed, peer-review itself has significant limits (e.g. see this great post from Titus Brown). Transforming the peer-system itself into a different beast entirely may be an integral and inevitable change in the future of science communication (perhaps for now the first-step is simply be publishing the peer-reviews themselves, such as Publons encourages).

Publications themselves usually come at the end of a scientific cycle: this begins with a professor

obtaining funding (not an easy thing in itself), who then hires temporary Post-docs or PhD's, who may work in relative isolation for a fixed period, and produce a few talks and papers as a project deliverable. Usually, these deliverables are then highlighted as the main justification why the individuals involved can re-enter the cycle. Often, after all of that work, the last thing many researchers want is have their manuscripts pulled apart, or their code/data examined in detail by a whole community! Rather than this approach, it would be much more productive to consider publishing as the beginning of a communal development process, akin to the way open source code is developed on Github, perhaps with discussion threads and up-votes attached like StackOverflow. However, this would probably require scientific funding to operate in a different manner (indeed, some scientists are experimenting with Crowdfunding to break away from current funding systems (see a recent IFLS post on the subject here), also Google and Mozilla are supporting Open science in different ways).

Working on the minimum-publishable unit: Instead of working to create a long masterpiece, there is a move towards rapid-communications, the so-called minimum-publishable unit. I see a future where such work could be tagged and categorised by research themes, methods, and keywords, with feedback/reviews included and open/tracked questions attached. For me a clear cornerstone of the future of science are open interdisciplinary tools such as Python, and broad literacy/adoption of Data Science practices. For some great reasons to get into Python check out this recent Nature comment article. I recommend Anaconda, IPython, and the Jupyter notebook to everyone! Through the reproducibility and collaboration of open science, communally-oriented research systems will allow science to iterate at a previously impossible rate. Exciting times!

At the moment there are relatively few incentives for scientists to learn new tools and switch to an open way of working. Particularly when it does not seem to translate to an increased likelihood of finding tenure or another contract. Perhaps it may even be harmful in some ways to achieving job security, as, by stepping outside of traditional publication systems, senior researchers may be unable to evaluate a candidates application by standards they are used to (essentially publishing in traditional journals and obtaining funding); the idea of credit and reputation would also be unrecognisable across the generational divide in science (as goes a famous quote of Max Planck 'Science advances one funeral at a time').

In the context of increasing pressures on post-docs to compete for relatively fewer positions which could offer them the chance of a stable life (a.k.a. the post-doc pile-up), it is not surprising that many are not anxious to change their practices in a way that could compromise their ability to compete with their peers (although perhaps help is on hand in the form of impact-aggregation services such as Altmetrics or Impactstory, which could make a convincing case on your behalf as to your personal impact outside of traditional journals).

So that is roughly the situation, it is unclear how open science and open access will change journals and if scientists can move to a totally different system of communication altogether, but that change has been under-way now for more than a decade (see nice time-line explanation here from PhD comic). Perhaps the biggest question left for a professional researcher is, how to make a practical career out of open science?