Web 2.0 and academic debate

Social media challenges traditions in scientific publishing

Philip Hunter

The Internet—in particular social media—has had an enormous impact on our daily lives, allowing anyone with a connection to publish, access, share, discuss and debate every variety of information imaginable. Following in the wake of the public's increasing use of social media to share and critique issues and ideas, the scientific community—for whom the Internet was ostensibly created—has also begun to use online tools to discuss the planning, conduct and publication of research, especially via post-publication review and commenting, but also through new modes of sharing and publishing the results of research. Not all publishers and scientists are yet ready to embrace these new modes of communication, but there is little doubt that social media is gaining in importance both in scholarly scientific communication and in communicating science with the public. Two interesting questions are whether and how these developments might affect the scientific publishing industry's current publication model—including pre-publication peer review and the existence of journals—and whether and how they might influence the conduct of research itself.

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The Internet has already made possible new publishing models including open-access publishers, pre-publication servers and even alternative business models such

as that of PeerJ, which charges authors a membership fee in exchange for “free” publication of their work in its journals. There is also PubPeer, which was launched in 2013 and allows people to comment on any research article that has a Digital Object Identifier (DOI). Meanwhile, Internet giants such as Amazon, Google and Facebook are already shaking up the news, book publishing and broadcasting industries, and it might be only a matter of time until they move into scientific publishing. Google Scholar, for instance, already provides an alternative search tool for academic literature based on the popular Google search engine; Amazon provides authors with tools to self-publish their books and directly market and sell eBooks on their website; and Facebook has just announced that it is going to publish articles from partner organizations directly in its users' news feeds on the iPhone—the publishers hope to get additional income from Facebook advertising (<http://www.wsj.com/articles/facebook-pushes-speedier-news-publishing-1431559007>).

Meanwhile, in the academic realm, a number of dedicated online journals have sprung up to offer scientists alternative routes to publication and publicity for their work, or to bypass the traditional pre-publication peer review model, often replacing it with post-publication commenting. An email response from PubPeer that represents their collective view claims that the impact of traditional journals and their peer review process will diminish. “Maybe the bottlenecks to scientific progress they represent will largely have been bypassed,” according to the email. “There will be widespread use of preprint servers, open-access publishing and full data sharing. Post-publication

peer review will be widespread and accepted.”

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How traditional publishers will respond to these new ideas in the long term is still not completely clear, but some are already making changes to introduce greater transparency and openness, or to find ways to enhance their publishing models. Yet, there is already a significant number of scientists embracing new forms of publishing and review. Dorothy Bishop, from the Department of Experimental Psychology at the University of Oxford, UK, for example, is particularly interested in greater transparency for peer review: “I think and hope there will be more of a trend to publish reviews with a paper, preferably not anonymised,” she said. “My preference these days is to publish in journals that do publish reviews.” Others, such as Kenneth Ka-Ho Lee, a stem cell researcher at the Chinese University of Hong Kong, believe that online commenting or social media should play a greater role in new forms of peer review. “I believe that novel open peer review journals like F1000 Research could play a role in the new landscape because the peer review process is open to the public and the manuscript submitted is in its raw unrevised form,” he said. “The raw form of the manuscript will allow all interested scientists to quickly pass judgment on the piece of work

and determine whether there is fraudulence at play or whether it is highly significant.”

Established journals acknowledge the impact of the Internet and social media on their business, but do not expect fundamental changes in the shorter term. Marcia McNutt, Editor in Chief of the *Science* journals group, for example, argues that there will be a continuing need for rigorous pre-publication peer review to maintain quality and to avoid flooding readers with a plethora of confusing results. “Most authors will tell you that peer review prior to publication improved the quality of what they published many times, and was very much worth the effort,” she said. “Everyone benefits from peer review, including those on social media who have much more cogent, readable, worthwhile papers to comment on once they are published.”

The view at *Science* is that social media will augment, rather than replace, traditional peer review for the foreseeable future. Yet at *Cell*, CEO and Editor Emilie Marcus

argues that social media is already playing a transformative role in reaching out beyond professional audiences to the wider public, which is becoming an increasingly important aspect of science communication. “Although seen as an add-on, the value of traditional and social media should not be underestimated,” she said. “Public awareness is important for supporting an informed society and for funding of research, and of course scientists are always happy to have their work covered in the *New York Times*.”

Nonetheless, there is broad agreement within the scientific community that however much social media may help connect with the public, its impact on research will be limited as long as success in science is judged by publication in high-impact journals. “Of course impact factor is the main driver that determines the landscape, and as long as university administrations quantify scientists according to journal

impact factor, journals like F1000 Research will be marginalised,” Lee conceded.

This raises the question of what impact social media might have beyond publication on the conduct, nature and even outcome of research. The key lies in the extent to which publication reflects feedback via post-publication review, which could affect follow-up research, especially when trying to repeat or refute results. “If journals and scientists embrace post publication review, it will have a great impact on research,” said Ivan Oransky, Vice President and Global Editorial Director at MedPage Today and Co-Founder of the site Retraction Watch. “People won’t waste so much time trying to replicate results when the work is clearly flawed.”

The prospect of active online debate after publication should also help to deter flawed work from being published in the first place, according to an email from PubPeer: “We hope that the existence of post-publication peer review will encourage researchers to be more honest about the level of support for

their pet hypothesis,” the journal stated in an email. “For every genuine breakthrough that did emerge from inauspicious beginnings, there are thousands upon thousands of ‘promising’ cancer and paralysis cures polluting the literature. The current pressure to publish in top journals and their requirement for fashionable and ‘high impact’ research has led to a damaging focus on and acceptance of overhyped claims.” This view is shared by Jonathan Eisen, at the US Department of Energy’s Joint Genome Institute at the University of California, who is an avid user of social media: “Yes, I do think some people will think twice about how they present results when they worry about getting attacked online for it,” he said. “Certainly there are examples of that already in areas like GMOs.”

However, McNutt argues that the use of open online forums to judge the quality of research could actually militate against pioneering work. “This is a hot topic of discussion among developers who want to use online voting methods to rate publications in terms of innovation, creativity, soundness of the science, and so on,” she said. “There is a general fear that truly disruptive ideas that may in fact be very right will fare poorly under such a system because they are threatening.”

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Some journals, such as F1000 Research, or the clinical trial site trialsjournal.com, are trying to develop more dynamic publishing models to reflect how ideas and findings evolve and shift over time, especially after post-publication review, rather than being cast in stone. “We are seeing great innovation in science publishing at the moment with the growth of independent peer review providers that were not on the scene 5 years ago, such as Peerage of Science and Axios Review,” said Jigisha Patel, Associate Editorial Director at UK-based open-access publisher BioMed Central. “Even the way we publish research may change as publishers experiment with

continual update of research articles as in trialsjournal.com.”

The success of online media will therefore depend on whether online discussion can change the fabric of peer assessment and evaluation across the whole of research, not just the publication stage of a project. Some, like Marcus, are sceptical of such an outcome: “I do not currently see either traditional or social media having an impact on the nature of the actual research scientists pursue,” she said. “Should things change, where there is a TripAdvisor equivalent for science and scientists that everyone uses to choose a post-doc lab, to evaluate job candidates, to grant tenure, to award grants, to find collaborators and so on, then I think what happens in the social media space will have a much bigger impact on the research itself, but that seems a long way off.”

There is one outcome of the increasing discussion of research online that is gaining in importance, however: the speed at which erroneous or fraudulent results are identified and retracted after publication. This has been highlighted by a few notorious cases, but one in particular brought this benefit to the fore recently, as it involved a leading journal and dramatic results that would have had a profound impact on medicine and human health.

In January 2014, *Nature* published two papers describing a radical new way of making stem cells, just by growing blood cells from adult mice, or potentially any mammal, in acidic media without the need for additional transcription factors. The researchers, a team from the RIKEN Centre for Developmental Biology in Japan and Harvard Medical School in the USA, called their method stimulus-triggered acquisition of pluripotency (STAP). This method would have revolutionized stem cell research by enabling straightforward production of pluripotent stem cells from adult cell lines, side stepping many current ethical concerns and technical problems. But some researchers were suspicious because the method sounded too good to be true, and, indeed, the first major attempt to replicate the results failed. Lee, who tried to replicate the paper’s findings, posted his results on ResearchGate, a social networking site for scientists, and eventually became one of those leading the campaign to have the papers retracted, which happened in July 2014, just 6 months after publication. It was a concerted social

media campaign that led to such a relatively swift result. “The two papers would have been withdrawn over time,” Lee said. “The claims were far too outrageous. But social media such as Knoepfler Lab Stem Cell Blog, ResearchGate, Twitter, Nature News blog and The Scientist, combined with mainstream media, especially the relentless Japanese press, significantly speeded up the withdrawal of the papers.”

In fact, there is some evidence that there is publication bias in favour of apparently major discoveries and that work in higher impact journals is more likely to be retracted owing to fraud [both reviewed in 1]. The authors of the review [1]—currently on a pre-print server and last updated in 2013—argue that using journal ranking of any kind as a tool for assessing the value of work is contradicted by the evidence that journal rank is a poor predictor of quality and is patently unscientific. They call for the journal system to be abandoned altogether and replaced by a library-based scholarly approach using the tools of information technology to assess work for publication. “I think we should use the scientific method and experiment with various forms of review and then settle on those forms that find widespread support,” said Björn Brembs, one of the authors, from the Universität Regensburg in Germany. “This may entail different forms of review in different fields. This may even entail different forms of review for different kinds of discoveries.”

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More generally, there is a growing sentiment that scientists should not be judged by where their work is published. “We must get away from the idea that published papers are sacrosanct,” said Oransky, who wants to see journals incorporate online and social media feedback into their publication cycle with a greater spirit of revisionism and ongoing debate. “I hope to see journals embrace post publication

peer review in a more robust way," he added.

This raises the crucial question of whether post-publication review should be transparent or whether there is a continuing role for anonymous comments. Oransky contended that outlawing anonymity might discourage constructive criticism from scientists who fear their honest feedback could damage their careers if the authors are colleagues or even employers. "People who are against anonymous peer review are ignoring the reality that peer review can be used as a cudgel," he said. Oransky argued that there is already evidence in favour of anonymous online peer review by comparing two web sites dedicated to post-publication peer review, but on different sides of the fence. On one side is PubMed Commons, which invites PubMed-indexed scientists to post comments that are accompanied by their name and institution to ensure transparency. PubPeer, on the other side, promotes anonymous comments. "I find PubMed very useful, but PubPeer has led to a lot more corrections of the scientific record," Oransky said. "There have been fewer corrections from PubMed Commons because people there are not so willing to stick their necks out."

This is a divisive issue though, with many scientists fearing that anonymity will prove counterproductive by amplifying the

impact of unfair criticisms. "Scientists are extremely worried about their names being mentioned on PubPeer, and several Japanese Scientists have already resigned because of the fear of themselves being subjected to a 'STAP-like' witch hunt," Lee said. "Being mentioned without putting up a vigorous defence could wreck a scientist's lifelong reputation. PubPeer and PubMed Commons will definitely make scientists more careful about their research, but I think comments should not be anonymous."

Others believe that an inexorable trend towards online review will eventually encourage transparency rather than anonymity. "We are proud that 80% of our authors choose to publish their full peer review history, and 40% of reviewers choose to sign their reviews making their name known to the author," said Georgina Gurnhill, Director of Marketing and Communications at PeerJ. "If we are already achieving such high adoption of open peer review in just over 2 years of publishing articles, then we believe that optional open peer review will gradually become the norm."

Open peer review will also be stimulated by demands from readers and researchers alike, according to Patel at BioMed Central. "Authors appreciate signed comments and the reading public can also read reviewer comments as well," she said. "It certainly makes for more a transparent and constructive peer review process. Given the general

trend towards openness and transparency in all aspects of publishing, I think it is inevitable that openness and transparency in peer review will become the norm."

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Amidst all the discussions about social media's impact on science, it is not just the fate of scientific publications or peer review that is necessarily at stake, but the possible effects on research itself through more transparency, greater scrutiny of published work and more immediate feedback from colleagues. Not just journals, but also authors and researchers will need to acknowledge and adapt to the changes that are taking place, which means at least engaging in post-publication review and analysis to a greater extent. More engagement by the scientific community could thus help to address the main concerns: the effect of negative comments and the risk of unfairly damaged reputations by anonymous allegations.

Reference

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