Essays

The role of social media in the research cycle

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Abstract
Different types of social media are being adopted by an increasing number of members within the scientific community, with researchers, publishers, and readers playing important roles in the scientific communication process. Recently, the ability to harness the online presence of articles has given rise to alternative web-based metrics as an indicator of social impact and a measure of community presence to supplement conventional bibliometric methods. This paper summarises the current uses of social media in science, and includes specially conducted interviews with Jon Tennant, a power user of social media and Euan Adie, founder of Altmetric.

Keywords
Social media; science communication; altmetrics; research process

Social media sites such as Twitter and Facebook, blogging networks and forums like Reddit[1] are increasingly serving the scientific community as active venues for the discussion and dissemination of scholarly research[2].

The evolution of scholarly communication over social media has gone hand-in-hand with the rise of open access, and vice versa. Networking sites facilitate the dissemination of freely available research, and create a way in which narrative and discourse can develop around scholarly output[1]. As a post propagates across user's feeds, it is able to quickly find audiences who would not otherwise have discovered it, enabling a form of research community to develop that is more inclusive, and more agile than the formal structures of traditional academia.

A 2015 special issue of Aslib Journal of Information Management[3] features research into social media uptake and motivation in academia. The editorial of the issue cites several papers which found "Twitter use for academics is around 10 percent", but concludes that "uptake varies among fields and by demographic characteristics (eg gender, age)". The 10% cited represents a very small proportion of the community when compared to the use of social media in the general population, which a 2015 study by Duggan *et al*[4] suggests may be around 70-80%. Barteau *et al* found 60% of surveyed researchers used traditional forms of media for work, but 40% said they would never use Twitter for the same purpose[5]. This leaves 60% who were either positively or ambivalently disposed, however, compared to the general population, 40% shows a large degree of assertive resistance to engagement.

So social media use appears to be dismissed amongst the majority of scientists. But what of those who do use it? Who are they? How are they using it? And why, if so few scientists appear to be in favour of adopting it, are we hearing so much about it at the moment?

Ian Rowlands of the Centre for Information Behaviour and the Evaluation of Research (CIBER) led an ALPSP study[6] analysing the responses of nearly two thousand researchers who regularly use social media. They identified seven stages of the research process in which social media played a significant role; "identifying research opportunities, finding collaborators, securing support, reviewing the literature, collecting research data, analysing research data, disseminating findings, and finally managing the research process." The authors concluded that "The three most popular social media tools in a research setting are those for collaborative authoring, conferencing, and scheduling meetings."

A substantial amount of scholarly social media activity involves researchers circulating and discussing articles with peers and their wider social networks. This circulation of scientific output is most effective with papers that are free to read, as no paywalls hinder the proliferation of readers and resulting social commentary. Open Access journal's sites like PLoS, F1000 Research and PeerJ feature integrated sharing buttons for authors to announce their articles. Subscription titles of traditional publishers often include a number of free-to-read *e*prints which authors may circulate however they see fit, with one recommendation being "use social media"[7].

Jon Tennant

Palaeontologist Jon Tennant was interviewed for the purpose of writing this article. His Twitter account @protohedgehog has 6,855 followers and he has published 57,800 tweets, at the time of writing. He is, in social media parlance, a 'power user', a PLoS Paleo Community Editor, European Geosciences Union blogger, and advocate of science communication and open access. Tennant comments on the pressures on academia to consider the readership of their work, by saying: *"Of pretty much every kind of career sphere out there, scientists are the only ones consistently slammed for not making their work more publically accessible. So there's this call to increase access to research for the good of the public, but we're still not changing papers to be written in a way in which they can be consumed more easily."*

One of the influences driving the open access movement are mandated policies such as the Research Councils UK policy on European projects[8]. This requires researchers to publish government funded research in an open access

form, for the benefit of public knowledge. In his comments above, Tennant alludes to the discrepancy between the specificity of language used in academic research, and unrestricted access to scientific output that open access strives to achieve. The popularity of science among the general population can be considered reasonably great, by measuring it with the traffic to websites such as *IFLScience*, that currently has almost 22 million Facebook 'likes' and 172,000 Twitter followers[9], or *HowStuffWorks,* with 40 million unique visitors and nearly 10 million podcast downloads a month[10]. Both these sites feature articles on developments in science in a way that is easily accessible, through shareable multimedia such as slideshows, audio or video presentations. However, these sites also link directly to source articles, serving as a bridge between academia and the public.

Tennant describes his experience of the social media effect on the readership of his articles: *"I can probably say that social media has vastly increased the readership for my work. I only started publishing in academic journals last year, and my citation count is still very low, but irrespective of that, I am still getting thousands of hits on every page, and hundreds of downloads which suggests to me that although academics aren't necessarily using my research, I am still getting used by a broader audience, which I assume comes through social media."*

Before an article is published there is the peer review process to consider, and whether social media plays any part. Tennant comments on the real-time reviewing of articles over social media: *"The traditional model of peer review is still very much alive and kicking…I don't see social media or any other social revolution as necessarily replacing that peer review process, but more being like an additional layer to it."*

So, peer review of a kind takes place over social media, restricted to the form of post-publication responses, and there appears to be little evidence, anecdotal or empirical, of papers being circulated for formal peer review through networking sites. Some journals do incorporate an open commentary system into the version of record, and as Tennant suggests, there would be benefits to formally capturing pre-publication peer review. *"If you publish with PeerJ, or F1000 Research, there's a comments system there, but it is not used for social media. What I would like to see at some point in the future is social media integrated into the traditional sites we have, and somehow even fed into the pdf at the bottom, then we will start to see more interesting forms of peer review".*


Euan Adie

Euan Adie, founder of the Altmetric internet analytics-tool was interviewed for this article, and he agrees with Tennant on the subject of harnessing these forms of review: *"I'm keen to see if post publication review will ever become widespread. There are some major blockers to it at the moment; you don't get credit for reviews and it's difficult to tell the suitability or reputation of a reviewer easily. This is what journal editors are good at. It's a bit funny that everybody is afraid of putting names to traditional peer review and of anonymous online review on places like PubPeer... perhaps the difference is that there's an editor picking the people behind the traditional reviews"*

A question to ask of the social media commentary of published articles is; can the public discourse have any effect on the research itself? Or, is it possible for it to be ignored since it exists outside of the traditional academic framework? Adie says "*Absolutely, think of older work like the arsenic life articles in Science and the work that Rosie Redfield and others did on social media*[11]*",* referring to the 2010 article published in Science titled *A Bacterium That Can Grow by Using Arsenic Instead of Phosphorus* written by Wolfe-Simon[12] and a group of researchers who were criticised across blogs, social media and news outlets for poorly reported research. The article caused such controversy that two papers were published by Science to compensate, but the original article itself was never retracted[13].

Prior to peer-review is the submission process. Tenant says that social media has not necessarily influenced any of his decisions around choosing which particular journal to submit to, but it has played a significant role in determining the types of journal he supports: "*When I started to engage with social media about four years ago, I began to learn about the issues around open access and how this can affect decisions of where to publish and the advantages of open access versus non-open access, and getting the maximum exposure for your work in a way that is ethically sound, in research. It hadn't even occurred to me really that there was this issue where science wasn't available to everyone. Through social media I've learned about OA, and over the last few years I've been campaigning almost every day for researchers to support OA, to advocate OA, and to publish OA."*

In writing articles for submission, there are an increasing number of instances where social media has crowd-sourced data collection and analysis, to help produce research and reports. An example of this, is the Wellcome Trust research, which published details of its open access spending in a Google Doc and crowd sourced the tidying, enrichment and analysis of it.[14] The raw data within Twitter itself has also been harnessed for research purposes, with almost 600 studies using the status updates of Twitter users as their primary data source[15]

In response to the developing narratives and life-cycles of articles around the internet, several alternative metrics have been developed to capture this activity and create something of tangible value from otherwise ephemeral web presence[16]. Adie says that his social media activity tool captures *"around twenty five thousand tweets containing a link to published research each day on Twitter; that's not including a far larger volume of people tweeting about science news stories, blog posts and so on".*

Altmetric was founded in 2011, with Plum Analytics and ImpactStory launched shortly after in 2012. These sites are web-based applications which record the activity of journal articles across five core engagement 'types'[17]: These forms of

engagement are garnering a lot of attention, as publishers and research assessment agencies attempt to employ them as tools to judge the worth of papers, or the people who write them. On this subject, Adie says: *"I don't think you can use social media metrics to judge quality. The closest you might want to get is using them to flag up discussion around a paper; to see if it's controversial in some way, or to see other people talk about an aspect of the paper you'd maybe missed."*

On the Higher Education Funding Council for England (HEFCE) Review[18] of methods of research assessment measurement, published in July 2015, Adie says: *"My take on it is that it points out that metrics shouldn't be used by themselves but could potentially be useful in conjunction with expert judgement. The HEFCE review doesn't look at social media activity in terms of attention, rather they are focused on quality and impact, and it's worth bearing in mind that all these are separate things. Attention is not a measure of quality or of impact, just like quality is not a measure of how much attention or impact something may have. They're correlated in all sorts of interesting ways but you can't shortcut assessment of two of them by just doing one."*

Tennant concluded the interview with an insightful and proactive suggestion for the development he would like to see researchers take in the future, with regards to the central themes of this article; social media, science, assessment and communication: "*What we need to do is move away from these poor man's criteria for assessment, that can benefit those who are already established in their careers, and move to a way in which we assess academics for their ability, willingness and skills in being open, transparent as researchers and more effective as communicators who are aware of how their research is being used. More effective communication is really where we need to be going with this stuff. There are so many bright academics who are moving this way already; that's what we need to shoot for I think. Metrics will play a role in that, and social media will be at the forefront of that.*

As a research community we are in the era of digital communications, and it's just a matter of embracing that and utilising it to its full potential. Then hopefully we'll be able to see this more democratic way of doing science, this greater understanding of knowledge a more informed society, and see this more engaged society, a more scientific society."

This article has highlighted a range of examples which demonstrate that social media can be used as an effective tool for science communication. The efficacy of social media as a system for dissemination, discussion, and curation of research may increase as researchers become more adept with its uses, and adoption of networking sites becomes more widespread. As use of social media becomes more engrained, so too may the methods of Altmetrics become more refined and useful in suitably measuring the presence of research around the internet. Social media has been thoroughly adopted by the general community on a wide and deeply established scale. If science seeks to engage with this community, then it may need to adapt its communication methods to suit the audience.

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