

The growth of social media in science

Social media has evolved from a mere communication channel to an integral tool for discussion and research collaboration

Philip Hunter

Social media has become so integral to today's world of work as well as leisure that its effective use for communications and collaboration has become a science in itself. Scientists can now obtain professional advice to exploit social media successfully and avoid pitfalls, both for communicating among themselves and with the wider public. Yet, at least when it comes to outward communication, many scientists are still reluctant to embrace the various channels, either out of concerns of attracting negative publicity or due to lack of time. Some researchers have even reined back on social media, not necessarily because they have endured bad experiences but rather dismay over some of the negativity circulating. Still, examples of how social media have enabled and eased collaborative research abound, and the ongoing Covid-19 pandemic and ensuing lockdowns are expected to further boost social media acceptance and use.

A plethora of channels and media

To conduct a rational assessment of the use of social media in science, it is necessary to distinguish between the various categories and channels. This has become harder as social media evolved and diversified to cater to particular communities. This fragmentation has eroded any clear definition of what social media is, commented Steve Midway, a fisheries ecologist at Louisiana State University in the United States and coauthor of a paper indicating that use of Twitter could boost citation rates in ecology and in other scientific disciplines [1]. "I don't feel I fully understand any more what social media is", he said. "When we started looking at social media around 2014/2015 it was

all Facebook and Twitter with a few others here and there. Now it's still Facebook and Twitter, but there are a whole load of others and people have niches within social media. I feel the landscape has itself changed, not just what is happening within that landscape".

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Some scientists would add LinkedIn to Facebook and Twitter as the big three general sites not dedicated specifically to science. Each has pros and cons from the perspective of communication both within and with the wider public. Facebook has the advantage of greater public reach, which makes it perhaps the best platform for establishing online communities or for collaborating in projects. Indeed, a 2018 study by the US-based think tank and polling group Pew Research Center found that Facebook posts related to research funding achieved the highest engagement levels on that platform (<https://www.pewresearch.org/science/2018/03/21/user-engagement-with-posts-on-science-related-facebook-pages-is-more-common-for-visual-posts-calls-to-action/>).

Twitter on the other hand has little direct value for seeking funding or collaborating, but has been widely used by scientists for interacting among themselves and tweeting about new research. Furthermore, Twitter activity does seem to correlate with citation rates, which in turn has drawn more

scientists to the medium. A 2018 survey related to conservation and ecology papers found a strong association between science communication, as measured by the Altmetric Attention Score, and citation rates [2]. This occurred even though there is usually a significant time lag between the initial social media communication and citations rolling in over the following months and even years.

Microsoft's LinkedIn—originally dubbed as the Facebook of work and business—is not the most widely used social media network, but commands the greatest respect among many scientists because of its professional focus. LinkedIn started as a platform for advertising vacancies, but it now also allows staging virtual laboratory meetings and discussions. Not surprisingly, this use has soared during the ongoing Covid-19 crisis. Indeed, LinkedIn has been promoting its virtual platform both to conduct remote interviews and to help sustain critical research. It has also been at the forefront of efforts to combat fake news over Covid-19 through a joint commitment with other major social media players: Twitter, Facebook, Reddit, Google, and the latter's subsidiary YouTube (<https://news.linkedin.com/2020/march/supporting-our-members-and-customers-during-covid-19>).

The situation is different in Mainland China. LinkedIn is available because it is not seen as a purveyor of subversive comment, but Google, Facebook, and Twitter are blocked. A lot of equivalent social media activity among Chinese scientists is conducted via WeChat, described as the country's app of everything. WeChat allows users to exchange personal posts, dubbed Moments, among friends or interest groups, as well as pushing a feed "Twitter-like" to

subscribers. It also performs the role of some niche apps or messaging sites elsewhere, such as Slack, which has gained popularity for real-time collaboration and discussing results or experiments. Chinese scientists can engage in similar interactions through WeChat's group chat function.

Specialized on research

The other major category of social media, even if not in the strictest sense, comprises the dedicated scientific sites which are generally not accessed much by the general public. These have a stronger focus on the scientific literature, with Academia.edu intent on disrupting traditional academic publishing. Other major players include Europe's ResearchGate headquartered in Berlin and Elsevier's London-based Mendeley. Then there is Semantic Scholar from the Seattle-based Allen Institute for AI, which is pitched more as a search engine, as is Google Scholar. Of these, ResearchGate and Academia.edu are the two largest and sometimes bracketed with Facebook, Twitter, and LinkedIn as the big five social media networks used by scientists.

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Academia.edu, the main focus of which is sharing publications, has just over 42 million registered users and more than 8 million papers listed. ResearchGate has a stronger focus on collaboration and its membership is currently 16 million users who are affiliated to an institution, which the network's co-founder and CEO Ijad Madisch regards as a key differentiator. “We do this to create a trusted community and content is always associated with a researcher's name and profile”, he said. Similar to LinkedIn, ResearchGate was founded around profile curation. “We then moved on to enable fairly simple behaviors such as Q&A”, Madisch added. “Next, we helped researchers to share data, before adding features around projects and teams”.

ResearchGate now has a greater ambition, according to Madisch, of encouraging researchers to be more open about their work. “One area where I would really like to see us pushing things forward is to help researchers to share their work, including negative results and failed experiments, earlier in the research cycle”, Madisch said. “This requires deep, cultural shifts in the ecosystem that supports science, including changes to the way that research is recognized and rewarded. So although ResearchGate has been going for 11 years now, we're really only just at the beginning of a long journey”.

Ups and downs

Many scientists regard these more dedicated networks either as a safe space for collaboration, or else more likely to benefit them than the big three. Some have actually retreated from general social media, not necessarily owing to bad experiences but out of frustration with a growing aura of negativity or just information overload. “I don't use social media much at all now. I deactivated my Facebook account five years ago and only do about five posts a year now”, commented Brandon Peoples, a fisheries ecologist from Clemson University in the USA and coauthor with Midway. “There's so much information coming that it can be overwhelming. Then there's so much negativity, for example when talking about this virus”, he added, referring to Covid-19.

Yet despite personal concerns, Peoples is more sanguine over the overall impact of social media on scientific publishing. “What social media does is, it gives people the opportunity for more equal visibility”, he said. It has, as Peoples indicated, achieved a degree of democratization by allowing individuals to publish work on a pre-print server and rely on those search engines such as Google Scholar to bring those papers to larger audiences without having to worry so much what journal they are published in.

Peoples also identified another aspect of democratization achieved by social media: giving a voice to scientists who would previously have been shy of communicating in public. “Just like anything, face to face communication is a good way, but some people can be introverted but seem very vocal or extravert on social media platforms”, he explained. “So that can give an opportunity for people to come out of their shell”.

There is a flipside though, which is that it is not always the best or most insightful scientists who come out of their shell. Or as Midway put it, “They who make the most noise on twitter are not necessarily the best scientists. A more real downside though is that twitter is a very rapid medium and so you should be careful to express what you mean”. More subtle insights do not lend themselves well to the short medium of Twitter especially. “Social media does not do nuance well and a lot of science is nuanced”, Peoples added.

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Choosing the right medium

Some of these problems can be averted by selecting the appropriate social medium. Madisch at ResearchGate concedes that Twitter is a vital tool for scientists and complements the more science-focused networks such as his own. “ResearchGate and platforms like Twitter work really well together”, he said. “The value that ResearchGate brings to researchers is relevance, trust and community. What Twitter offers is the potential for very rapid and broad engagement. [...] Scientists share on Twitter the work that they do on ResearchGate”.

It is indeed Twitter that is often at the front line of communication for scientists and it is the medium where pressure can be exerted on academic institutions and even funding bodies over decision making, according to Billie Swalla, Chair of the University of Washington's Biology Research Committee. “Twitter has been best to get bad decisions reversed at universities because they hate the negative press”, he said. In some cases, it has proved fruitful in promoting work and attracting funding, although success there is more mixed, Swalla added. “I have heard of others being contacted by NIH (National Institutes of Health) after putting something on Twitter, but I have never been so lucky”.

Facilitating collaboration

For many scientists though, the most practical and sustained advantages of social media

are the collaborative aspects: facilitating ready exchange of information and obtaining answers to questions faster than could be done otherwise, according to Orazio Romeo, a molecular epidemiologist from the University of Messina in Italy. “I think the main advantage for a scientist in the use of social media is the quick ‘comparison’ with other expert colleagues who help to better understand and interpret the results generated by the experiments, often making it possible to ask new kinds of research questions”, he explained. “Moreover, there are also several technical advantages as it is possible to share step-by-step lab protocols or ask comments about experimental procedures and methods, troubleshooting and tips from experts in the field, activities that until a few years ago were possible only by participating in too-expensive congresses”.

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But maybe the greatest and most memorable benefits are establishing long-lasting collaborations that otherwise might not have been possible. Romeo gave one example of a collaboration with Nigerian fungal pathogen specialist Emmanuel Nnaemeka Nnadi, currently at that country’s Plateau State University in Bokokos. “When I first met Emmanuel in 2011 on ResearchGate, he was still a MSc student who was working on molecular characterization of Nigerian flu-

conazole-resistant *Candida albicans* isolates for his thesis”, Romeo recalled. “By contrast, my research focused mainly on the isolation and molecular identification of *Candida Africana*, a particular *C. albicans* biovariant that shows an exceptional ability to colonize and infect mainly human genitalia. Therefore, we decided to collaborate and Emmanuel sent to my laboratory hundreds of fungal strains to study. We published the results in *Medical Mycology*, and this was just the first of a long series of scientific papers published in important peer-reviewed journals in the area of medical mycology. The last article was recently published in *Mycopathologia* and reports the whole-genome sequencing and assembly of an uncommon MLST genotype of the pathogenic fungus *Cryptococcus neoformans* recovered in Nigeria”.

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Romeo highlighted this as a great example of social media’s upside, the ability to strike up serendipitous collaborations between people who have never met. “It is extraordinary and surprising how Emmanuel and I have worked together and produced articles for years without ever meeting personally”, he said. “After 7 years we met for the first time at the 20th Congress of the International Society for Human and Animal Mycology in Amsterdam in 2018. It was very

exciting and moving for both of us and it gave me an opportunity to discuss with him also about our life experiences, goals and expectation, including the scientific research in Nigeria”.

Such experiences will likely become more common during the lockdowns to battle the corona pandemic, which has thrown many research projects into jeopardy. Just as importantly though, the crisis has underlined the importance of accurate science communication via the big social media channels to counter the torrent of fake news. Recognizing this, the World Economic Forum has called on scientists to engage much more with the public through social media: “the world needs more scientists who want to translate their expertise into effective communication on global concerns and anxieties to cut through the noise of fear and assumptions based on the unknown” (<https://www.weforum.org/agenda/2020/03/science-communication-covid-coronavirus/>). According to Swalla, some scientists have been stepping up to the plate, even if the message does not always get across. “It has been interesting during the COVID-19 pandemic to see how scientists are doing their best to convey very difficult ideas to the general public, with mixed success”.

References

1. Peoples BK, Midway SR, Sackett D, Lynch A, Cooney PB (2016) Twitter predicts citation rates of ecological research. *PLoS ONE* 11: e0166570
2. Lamb CT, Gilbert SL, Ford AT (2018) Tweet success? Scientific communication correlates with increased citations in ecology and conservation. *PeerJ* 6: e4564