

Current Commentary

Peering over the shoulders of giants?

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within research projects. Ann recently completed her PhD at UWE, looking at ways in which the emerging ideas and practice of open science can be a medium for public access to and involvement in the process of science and an innovative method for real-time science communication.

Ann has been a prominent member of the international Café Scientifique movement since she started the Bristol Science Café in 2003. Since 2010, she has been voluntary webmistress for the network, advising, supporting and mentoring new café organisers around the world and hosting and maintaining the website.

'Open' is a highly-visible cultural trend of the early twenty-first century. A brief scan of a newspaper or quick Internet search reveals it as a prefix to learning, source, standard, data, knowledge, democracy, access, repository, innovation, government, science and probably more. The expectations of the broadband generation – young people born around the turn of the century – for openness and instant, on-demand access to information¹ affect research as much as any other social activity. As the world's population of digital residents – those who see the Web as the place where they express opinions, form relationships, develop an identity and belong to a community² – grows, the expectation that the Web will be the place where information is created and communicated will grow alongside them.

In response, the media have become hydra-headed and researchers have become public intellectuals in unforeseen ways: online editions of what we used to call newspapers include comment pages, blogs, and links to journal papers³, citizen journalism thrives, radio and television programmes sprout links to university websites, educational material and background material, and no self-respecting research project seems complete without its website and social media accounts.

However, while these and other routes seem to offer interested viewers the chance (paraphrasing Newton) to peer over the giants' shoulders and see what they're doing in their ivory fortresses, those attempting this feat can find themselves routinely frustrated by blocked access, paywalls, out-of-date websites, subscription demands and curtailed documents.

In the UK, USA, Europe and Australasia, since the mid-twentieth century, scientists have increasingly demonstrated a willingness to engage with the public (and indeed, members of the public shown a willingness to engage with science). Over time, the labels have changed:

scientific literacy, public understanding of science, scientific culture, public awareness of science, science communication, public engagement with science^{4,5} but the interaction has always tended to be after the research is over and the researchers can show the public a clean, crystalline sphere of perfected results. Science is not like that, as scientists know; real research is messy, tentative and dynamic. To see its real creativity and inventiveness, we need to see the scientist in action in the laboratory, banging the test tubes together⁶.

‘Open science’, which Neilsen (p.32) defines⁷ as the sharing of ‘everything – data, scientific opinions, questions, ideas, folk knowledge, workflows and everything else as it happens’⁸ is an emerging approach to the practice of science, in which the whole research process is conducted in the open, from formulating research questions, to designing methodologies, to publishing data and results. This wholly open approach, sometimes called ‘open notebook science’⁹ is, in practice, followed by only a relatively small group of strong advocates¹⁰. However, many researchers are happy to be open with certain aspects of their work: publishing in open access journals (which is becoming more common, especially as funders increasingly make this a condition of grants); depositing copies of publications in open institutional repositories or disciplinary archives (such as arXiv.org for maths and physics); maintaining websites, writing research blogs, contributing to social citation services and communicating about their work on social media. In fact, many of the behaviours that make research open can be seen as extensions or an evolution of day-to-day work: the paper notebook is replaced by an electronic version, from which data can be automatically collated and made to flow on to a project website; a research log becomes a research blog, enhanced by a blog’s ability to support dialogue through comments and responses; documents are collaboratively created and the common room chat migrates to social media.

Although many projects that label themselves ‘open science’ were designed by researchers for researchers, as a quick and effective way to share methods, information and results across large, often multi-site and multi-national research groups, research performed in the open is potentially open to anyone; at least, anyone with access to the Internet. Although the phenomenon of ‘lurking’ is well-known across a variety of websites and projects⁷, the presence of a wider audience has been observed by researchers, suggesting that people find the information available useful or at the very least, interesting¹¹.

By making the process visible and the outputs obtainable, open science can potentially claim a place in the map of public engagement pathways. Its point of departure from existing modes is that it enables people beyond the research community to engage directly and in an unmediated manner with research – its data, information and methodologies – as much as with researchers, their views, opinions and ideas. For some, peering over the giant’s shoulder to see what is going on is enough but others will welcome the chance to engage with real, raw, data. Through open science, people with all kinds of backgrounds are offered a means to express their ideas and contribute their varying perspectives, expertise and skills to research projects¹². As well as a route for participation, open science allows citizens, civic groups and non-governmental organisations a route for access to evidence that can enable them to scrutinise conclusions. Finally, many researchers feel a personal sense of obligation that it’s just the right thing to do; that the results of publicly-funded research *should* be open to the public that pays for them¹³.

One could argue that research has always been open. Since the founding of the first scientific journals in the seventeenth century, researchers have shared methods, results and data within their community. Twenty-first century ‘open science’ in many ways simply extends that community. However, this very transparency brings certain perils: both researchers

and public groups have concerns about issues such as the possible misuse of public data by special-interest groups or accusations of data manipulation by researchers. Open science can make an important contribution here: when raw datasets are made available, alongside the methodologies through which the research was conducted, the published and polished conclusions based on that data can be compared, contrasted and effectively evaluated. Context and narrative are key: available data is not the same as accessible data. It is vital that all participants can see the hinterland of the data; the context in which the data can be set¹⁴. Open science – with its complete record of the process – could provide the circumstantial and background material that allows users to set the content, data and information in context and also serve to remove the technicalities that can be a barrier to comprehension and usability.

Open science has the potential to connect people with similar interests, enhance interactions and expand the boundaries of engagement. It can support honesty and accountability, both within communities of researchers and in their exchanges with the wider public. Making research outputs readily and openly available means new participants can be recruited, new skills brought into projects and different kinds of expertise made use of. However engagement with active research through open science will require everyone involved – professional scientists, amateur researchers and interested members of the public – to adapt. Researchers will have to adapt the social and cultural practices handed down through generations of academic practice and develop the skills to annotate, classify and contextualise complex data so that it becomes accessible to users outside their immediate community. Members of the public will have a new route for engagement that they can use in a variety of ways, from simply following the progress of a project, to engaging *via* comments and responses, to contributing their time and effort. It also offers a route for members of the public to directly access research outputs. However, this means they will have to be prepared to develop the skills needed to interpret and analyse raw data. People accustomed to seeing research outputs that have been shaped, tidied, organised and normalised may be confused, terrified or bored by the sheer quantity of raw data that pours out of some research projects.

Nevertheless, the social mood of the moment (at least in western nations) is in favour of openness. Governments have reacted to the public expectation of transparency and are beginning to offer their people a route by which they can contribute their views on the problems and issues that affect everyone's daily lives. By and large, people trust science and scientists, and are willing – even eager – to engage with research. In their turn, researchers acknowledge that part of their licence to practice derives from their willingness to engage with the public. Open science has the potential to support meaningful engagement, dialogue and collaboration; it will just require a little bit of hard work on the part of all participants, if they're to be able to climb on the giant's shoulders.

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