

#science communication

How do we foster open scientific dialog in the digital age while respecting the integrity of the scientific process?

Open communication is essential for the progress of science. Though individual scientists generate ideas and experiments, they depend on interactions with local colleagues and increasingly with collaborators across disciplinary, institutional and national boundaries. Scientists may learn about new scientific developments through seminars at their home institutions or by attending scientific conferences. However, the publication of peer-reviewed papers in scientific journals is the primary means by which discoveries are disseminated through the scientific community. Ideally, the most exciting of these discoveries are subsequently translated to the public through the scientific media. This traditional model of scientific information sharing has been successful in ensuring that scientific advances are vetted by the scientific community before being transmitted to the broader society.

Social trends and advances in technology are fostering new modes of scientific communication. The idea of ‘open science’ in which scientists are encouraged to collaborate by freely sharing methodologies and data on the Internet is compelling to many researchers, and web technologies have provided tools that enable this desired openness and transparency. For instance, open data repositories and consortia that are committed to the immediate release of new data are becoming more common. Journals are offering functionalities that permit commenting on the online versions of published papers, which facilitates the ongoing archival discussion of studies following peer review. Blogs written by scientific researchers, which initially gained popularity for informal scientific communication, are increasingly viewed as forums for the discussion of scientific data. More recently, blogs and social networking tools such as Twitter have made it possible for scientists to communicate in real time from anywhere, including scientific conferences, and for this information to be, at the same time, available to the general public.

These new communication tools offer great potential for extending conference ‘attendance’ to more scientists, but this has conference presenters and organizers concerned. Traditionally, ‘closed’ meetings have offered researchers and attendees the opportunity to present and discuss unpublished preliminary data. Premature communication of these data, through online forums, may prove to be a disadvantage in competitive research areas. This fear, in combination with intellectual property concerns, may make academic and industrial presenters increasingly unwilling to discuss their most exciting findings. A real danger exists that scientific conferences will devolve to collections of reports focused only on published data (*Nature* 460, 152, 2009).

Such concerns have forced conference organizers to reexamine their policies. Prompted by events at a recent meeting, Cold Spring Harbor Laboratory conference organizers have extended policies to scientific conferees that were previously only applied to journalists: anyone wishing to write, blog or ‘tweet’ about content at the conference must first obtain the permission of speakers (*Nature* 459, 1050–1051, 2009). Meeting organizers have also had to reconsider their definitions of ‘closed’ versus ‘open’

scientific meetings (*Nature* 460, 152, 2009). For scientific meetings that seek to encourage the discussion of new primary data, closed meetings—in which presented data or statements made by conferees remain strictly ‘off the record’—are an important format. However, given the changing landscape, conference organizers will need to make these policies clear in advance, and all attendees must agree to abide by them.

In contrast, some communities or topics are best served by more open meeting formats. For example, SciFoo, an annual ‘unconference’ sponsored by O’Reilly, Google and Nature Publishing Group (<http://www.nature.com/scifoo/>), brings together a diverse group of people interested in science and technology to generate and discuss new ideas. In this context, web tools including wikis and blogs offer ideal media for the simultaneous exchange of ideas among conference participants and with the broader scientific community. This approach will become increasingly common as scientists strive for greater openness.

New media such as blogs and Twitter can greatly facilitate scientific communication, and may offer a route for engaging scientists more directly with the public. Yet the ‘scientist as journalist’ model that is supported by these technologies presents challenges as a general mechanism for distributing scientific information. Transmission of unpublished data on the Internet circumvents the peer-review process that serves as our primary quality control mechanism to ensure that scientific studies are technically sound before they are communicated to the public. Presenting unpublished results from meeting presentations and posters as established facts may create misunderstandings between scientists and could lead to major misconceptions of ongoing research discoveries by the general public, who may have a limited understanding of the scientific method and peer review.

The first step toward a more open system of scientific communication is an enhanced public understanding of the scientific method and the peer-review process. Scientists understand this, but they must play a greater role in these educational efforts. In the meantime, we maintain that embargoed press coverage of newly published scientific studies serves an important purpose to ensure that science reporting occurs only after peer review. Press embargoes also provide adequate lead time for journalists to prepare informed news stories to coincide with publication of a new research study (for example, see Nature Publishing Group’s embargo policy: http://www.nature.com/authors/editorial_policies/embargo.html). Scientists who wish to engage with the online community should draw on the positive aspects of this system as they aim for greater openness.

Scientists should experiment with new communication styles and technologies, which offer potential benefits for collaboration, data sharing and the advancement of scientific thinking. As these technologies gain wider acceptance, scientists must agree on guidelines for their appropriate use in the context of scientific discourse, and these guidelines should be consistent with our common goal of ensuring the integrity of the scientific information that we share among scientists and communicate to nonscientists. ■