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Joint efforts

At its best, academia is a marketplace of ideas. But many scientists are reluctant to embrace the latest web tools that would allow them to communicate their ideas in new ways, says Declan Butler.

When Tim Berners-Lee invented the World Wide Web in 1989, he saw it as a collaborative workspace for his fellow scientists at CERN, the European particle-physics lab near Geneva, and beyond. His creation went on to surpass his prediction that "the usefulness of the scheme would in turn encourage its increased use". But in the rush to develop the web as a flexible way to find information, the original concept of users interacting in real time was largely forgotten. Fifteen years later, the web seems to be returning to its roots.

For most users, the web in its first decade was like a big online library, where they mainly searched for information. Today it is undergoing a subtle but profound shift, dubbed Web 2.0, to become more of a social web, not unlike Berners-Lee's original vision. Yet scientists are largely being left behind in this second revolution, as they are proving slow to adopt many of the latest technologies that could help them communicate online more rapidly and collaboratively than they do now.

"I find it ironic that science is about the adoption, discovery and exploitation of new knowledge and techniques, yet the biggest revolution on the web is passing us by," says Greg Tyrelle, a bioinformatician at Chang Guan University in Taiwan. He has been experimenting with blog (short for web log) software for five years to interact with a growing audience of his peers and the wider public.

The emerging web is largely being shaped by dynamic interactions between users in real time. But many researchers still see publications in the formal scientific literature as 'the' means of scientific communication. Although the traditional published paper is accepted as the undisputed information of record, younger researchers, in particular, are concerned that scientists are missing out on new ways to communicate with each other and the public.

They recommend the use of collaborative technologies such as blogs and wikis, websites that any visitor can add to and edit. Supporters say these offer a forum for broader and more timely discussion, to complement the existing system of peer-reviewed journals. This could enhance science communication, both before publication, when generating ideas, and after publication, when discussing results (see 'Open house', opposite).

"Until blogging is seen as normal, worries about what your supervisors think will continue to be a problem." — Gavin Schmidt

C. DARKIN

Blogs are just one example of new social technologies that are allowing more people to publish more easily and in more diverse ways on the web. By allowing reader feedback and syndication feeds, blogs create an instant online community. "Blogs can offer any kind of content — from peer-reviewed articles to sheer speculation to rants, and everything in between," says Amy Gahran, an expert in new media and editor of Contentious.com.

The write stuff

The best-known wiki is the online encyclopaedia, Wikipedia, which has grown to almost a million entries since its launch in 2001. Scientists at Harvard and the Massachusetts Institute of Technology (MIT) recently started their own wiki, OpenWetWare, to apply the same approach to sharing lab protocols and data among biology groups worldwide.

C. FIELD

Outside academia, blogs are taking off in a big way. A study published in October by the Guidewire Group, a research firm in new media, says that 90% of marketing communication companies have either launched, or intend to launch, internal blogs. There are now some 20 million blogs, permeating almost every sector of society. But science is a glaring exception, and today there are still only a few dozen scientific bloggers.

Scientists who blog see their activities as a useful adjunct to formal journals, not a replacement. "The standard scientific paper is irreplaceable as a fixed, archivable document that defines a checkpoint in a body of work, but it's static, it's very limited," says Paul Myers, a biologist at the University of Minnesota, who blogs at Pharyngula.

"Put a description of your paper on a weblog, though, and something very different happens," says Myers. "People who are very far afield from your usual circle start thinking about the subject. They bring up interesting perspectives." By sharing ideas online, you get feedback and new research ideas, he says.

A senior US epidemiologist who blogs once or twice a day under the pseudonym 'Revere' on his public-health blog Effect Measure, has attracted a diverse readership. "About 1,500 people visit each day," he says. "If someone told me that I could show up at a lecture hall every day and deliver a short opinion, and that 1,500 people would show up to hear me, I'd be pretty satisfied — 1,500 is twice the subscription of many speciality journals."

But for most scientists and academics, blogs and wikis remain unattractive distractions from their real work. Many consider them an online version of coffee-room chatter, background noise that goes against the very ethos of heavily filtered scholarly information.

Opinion pieces

Scientists who frequent the 'blogosphere' see it differently. The dynamic hierarchy of links and recommendations generated by blogs creates powerful collaborative filtering, they argue. Blogs may create noise, but they are a great way of keeping up with what's hot in your field, says Tyrelle, who blogs at Nodalpoint.org. He believes that the more bloggers there are in a particular community, the more efficient this filtering becomes, so — counter-intuitively — reducing information overload.

Tyrelle suggests that this is not so different from BioMed Central's Faculty of 1,000, a popular fee-based service that highlights biology papers according to recommendations from a subset of 1,000 scientists. But in the blogosphere, this service is free and could marshall input from a subset of 10,000 scientists or more.

Yet even the most web-savvy scientists remain unconvinced that blogs have any useful role in science. "I have my doubts that blogging reduces information overload, but blogging will survive as it appeals to all the exhibitionists," quips Rolf Apweiler, a bioinformatician at the European Bioinformatics Institute in Hinxton, UK, and head of the UniProtKB/Swiss-Prot protein-sequence database.

Others disagree. "Science is too hung up on the notion of 'the paper' as the exclusive means of scientific communication," says Leigh Dodds, a web expert at the publisher Ingenta. Publication and research assessments are more geared to measuring a researcher's standing than communicating science, he claims.

Open house

Online pioneers they are not, but traditional publishers are not entirely stuck in the past. Publishing online often means bundling supplementary information with a mirror copy of the print article, but the web is now being used to open up some journals to more interactive discussions — previously only possible at conferences.

The *BMJ* website led the way in allowing readers to post 'rapid responses' to published articles. But in June this year, the *BMJ* changed its criteria for accepting online contributions — adding heavier moderation. Journals thinking of adding companion blogs (see main text) will also want to moderate comments.

Atmospheric Chemistry and Physics (*ACP*), published by Copernicus, uses online discussion to open up the peer-review process. Papers are published online quickly and referees post comments online, anonymously if they wish. Authors, and other researchers, can chip in as long as they identify themselves. After the discussion is closed, editors use it to shape the final version of a paper.

Advocates say the online debate improves the final product. "It lets others see what the leading people in the area are thinking and forces editors, referees and authors to work at a higher standard," says Scot Martin, an environmental chemist at Harvard University and an editor at *ACP*.

Arne Richter, managing director at Copernicus, has high hopes for the journal, which has gained a healthy impact factor of 2.7 since its 2001 launch. But Richter admits that of six Copernicus journals with online discussion, not all have been welcomed by users. *Hydrology and Earth System Sciences* added open peer review seven years after its launch. "A tribe of very conservative scientists keeps asking why there has to be a discussion feature," says Richter. "They just don't want it."

The editors of a new online journal to be published by BioMed Central think biologists are ready for open peer review. *Biology Direct* authors have to solicit their own reviews from an editorial board, and the comments appear online for all to see.

"In many areas of biology there's roughly a one-in-three chance one of your reviewers just won't like your point of view," says editor-in-chief David Lipman. If that were to happen to a *Biology Direct* paper, it would still be published. But anyone could read the naysayer's comment.

Tom Simonite

Jennifer Hallinan, a biologist at the University of Queensland, Australia, who runs the blog Cancer Dynamics, agrees with him. The web is providing a hierarchy of sources, she says, including useful blogs and wikis. "Each level of the hierarchy has its own sources of error, its own strengths and weaknesses," she explains, "but these are known and can be taken into account when using them."

Blogs associated with traditional journals may help bridge the gap between the literature and blogs, says Glenn McGee, editor-in-chief of *The American Journal of Bioethics*. The leading journal in its field, it was the first to create a companion blog, Blog.Bioethics.Net.

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S. MYERS

The bioethics blog allows the journal to respond faster and in different ways to public controversies, says McGee. The blog has high impact, he adds, often influencing reporting on ethical issues by the mainstream media.

Print journals cannot keep up with developments in certain fields, adds Gavin Schmidt, a researcher at NASA's Goddard Institute for Space Studies in New York, who blogs at RealClimate.org with other climate scientists. The blog helps to reduce noise by setting the record straight, says Michael Mann, another RealClimate blogger and director of Pennsylvania State University's Earth System Science Center, citing as an example a recent post on whether hurricanes are linked to global warming (see www.realclimate.org/index.php?p=181).

McGee and Schmidt have permanent jobs, and both agree that many scientists don't blog because they fear it has a poor image and could damage their careers. Most younger biologists blog anonymously, says Roland Krause, a researcher at the Max Planck Institute for Molecular Genetics in Berlin and a bioinformatics blogger. "Many fear that their superiors consider it a waste of time, or even dangerous," he says. Schmidt agrees: "Until blogging is seen as normal, this will continue to be a problem."

Others fear being scooped by rivals. "In many institutes it's just way too dangerous to discuss work in progress with the people across the floor," regrets Krause — let alone on a blog.

Such fears are dated, argues Jason Kelly, an MIT graduate student involved in OpenWetWare. The upcoming generation, he says, believes that excessive competition can harm science; they see the benefits of brainstorming their research ideas on blogs as far outweighing the risks.

Kelly admits some may regard this view as naive. But Schmidt suggests that once scientists come up with some sort of peer-review mechanism for blogs that increase their credibility, without diminishing their spontaneity, blogs will take off. ■

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