

More than a blog

Should science bloggers stick to popularizing science and fighting creationism, or does blogging have a wider role to play in the scientific discourse?

Howard Wolinsky

Last December, astrobiologists reported in the journal *Science* that they had discovered the first known micro-organism on Earth capable of growing and reproducing by using arsenic (Wolfe-Simon *et al.*, 2010). While media coverage went wild, the paper was met with a resounding public silence from the scientific community. That is, until a new breed of critic, science bloggers, weighed in. Leading the pack was Rosie Redfield, who runs a microbiology research lab in the Life Sciences Centre at the University of British Columbia in Vancouver, Canada. She posted a critique of the research to her blog, *RRResearch* (rrresearch.fieldofscience.com), which went viral. Redfield said that her site, which is typically a quiet window on activities in her lab got 100,000 hits in a week.

This incident, like a handful before it and probably more to come, has raised the profile of science blogging and the freedom that the Internet offers to express an opinion and reach a broad audience. Yet it also raises questions about the validity of unfettered opinion and personal bias, and the ability to publish online with little editorial oversight and few checks and balances.

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Redfield certainly did not hold back in her criticism of the paper. Her post said of the arsenic study: "Lots of flim-flam, but very little reliable information. [...] If this data was presented by a PhD student at their committee meeting, I'd send them back to the bench

to do more clean-up and controls." She also opined on why the article was published: "I don't know whether the authors are just bad scientists or whether they're unscrupulously pushing NASA's 'There's life in outer space!' agenda. I hesitate to blame the reviewers, as their objections are likely to have been overruled by *Science's* editors in their eagerness to score such a high-impact publication."

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Despite the fervor and immediacy of the blogosphere, it took *Science* and Felisa Wolfe-Simon, the lead author on the paper, nearly six months to respond in print. Eventually, eight letters appeared in *Science* covering various aspects of the controversy, including one from Redfield, who is now studying the bacteria in her lab. Bruce Alberts, editor-in-chief of *Science*, downplayed the role that blogging played in drumming up interest in the controversial study. "I am sure that the number of letters sent to us via our website reflected a response to the great publicity the article received, some of it misleading [...] This number was also likely expanded by the blogging activity, but it was not directly connected to the blogs in any way that I can detect," he explained.

Bloggers, of course, have a different take on the matter, arguing that it was another example of a growing number of cases of 'refutation by blog'. The blogging community heralds Redfield as a hero to science and science blogging. By now, more traditional science media outlets have also joined the bloggers in their skepticism over the paper's

claims, with many repeating the points Redfield made in her original blog response.

Jerry Coyne, an evolutionary geneticist at the University of Chicago in the USA, writes the blog *Why Evolution is True* (whyevolutionistrue.wordpress.com), which is a spinoff from his book of the same name. He said that bloggers, both professional scientists and journalists, have been gaining a new legitimacy in recent years as a result of things such as the arsenic bacteria case, as well as from shooting holes in the 2009 claims that the fossil of the extinct primate *Darwinius masillae* from the Messel Pit in Germany was a 'missing link' between two primate species (Franzen *et al.*, 2009). "[Blogging has] really affected the pace of how science is done. One of the good things about science blogging, certainly as a professional, is you're able to pass judgment on papers instantly. You don't have to write a letter to the editor and have it reviewed. [Redfield] is a good example of the value of science blogging. Claims that are sort of outlandish and strong can be discredited or at least addressed instantaneously instead of waiting weeks and weeks like you'd otherwise have to do," he said.

Perhaps because of the increasingly public profile of popular science bloggers, as well as the professional and social value that is becoming attached to their blogs, science blogging is gaining in both popularity and validity. The content in science blogs covers a wide spectrum from genuine science news to simply describing training or running a lab, to opinionated rants about science and its social impact. The authorship is no less diverse than the content with science professionals, science journalists and enthusiastic amateurs



all contributing to the melting pot, which also has an impact on the quality.

Carl Zimmer is a freelance science journalist, who writes primarily for the *New York Times* and *Discover Magazine*, and blogs at *The Loom* (blogs.discovermagazine.com/loom). "Most scientists have not been trained how to write, so they are working at a disadvantage," he said. "[Writing for them] would be like me trying to find a dinosaur. I wouldn't do a very good job because I don't really know how to do that. There are certainly some scientists who have a real knack for writing and blogs have been a fantastic opportunity for them because they can just start typing away and all of a sudden have thousands of people who want to read what they write every day."

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Bora Zivkovic, who is a former online community manager at Public Library of Science, focusing mainly on *PLoS ONE*, is one of those scientists. A native of Belgrade, he started commenting in the mid-1990s about the Balkan wars on Usenet, an Internet discussion network. He began blogging about science and politics in

2004 and later about his interest in chronobiology, which stems from his degree in the topic from North Carolina State University. He still combines these interests in his latest blog, *Blog Around the Clock* (blogs.scientificamerican.com/a-blog-around-the-clock). Last year, *Scientific American* named Zivkovic its blog editor and he set up a blogging network for the publication. "There isn't really a definition of what is appropriate," he said. "The number one rule in the blogosphere is you never tell a blogger what to blog about. Those bloggers who started on their own who are scientists treasure their independence more than anything, so networks that give completely free reign and no editorial control are the only ones that can attract interesting bloggers with their own voices."

Daniel McArthur, an Australian scientist now based in the UK, who blogs about the genetic and evolutionary basis of human variation at *Genetic Future* (www.wired.com/wiredscience/geneticfuture), and about personal genomics at *Genomes Unzipped* (www.genomesunzipped.org), said that it is difficult to define a science blog. "I think it's semantics. There are people like me who spend some time writing about science and some time writing about industry and gossiping about things in the industrial world. Then there are the people who write

about the process of doing science. There are many, many blogs where [...] the content is much more about [the blogger's] personal voyage as a scientist rather than the science that they do. Then there are people who use science blogging as an extra thing that they do and the primary purpose of their blog is to add political advocacy. I think it's very hard to draw a line between the different categories. My feeling is that science bloggers should write about whatever it is they want to write about."

The ability to distribute your opinion, scientific or otherwise, online and in public is raising difficult questions about standards and the difference between journalism and opinion. Sean Carroll, who writes for the physics group blog *Cosmic Variance* (blogs.discovermagazine.com/cosmicvariance), is a senior research associate in the Department of Physics at the California Institute of Technology in the USA. "Some blogging is indistinguishable from what you would ordinarily call journalism. Some blogging is very easily distinguishable from what you would ordinarily call journalism," he said. "I think that whether we like it or not, the effect of the Internet is that readers need to be a little bit more aware of the status of what they

are looking at. Is this something reputable? Anyone can have a blog and say anything, so that one fact is both good and bad. It's bad because there is a tremendous amount of rubbish on the Internet [...] and people who have trouble telling the rubbish from the good stuff will get confused. But it's also good because it used to be the case that only a very small number of voices were represented in major media."

"Passion is an important part of this. If you can communicate a love of the science that you're talking about, then you're a natural for blogging"

Zimmer contrasts the independence of blogging with traditional journalism. "You really get to set your own rules. You're not working with any editor and you're not trying to satisfy them. You're just trying to satisfy yourself. In terms of the style of what I do, I will tend to write more—I think of [my blog posts] as short essays, as opposed to an article in the *New York Times* where I'll be writing about interviewing someone or describing them on a visit I paid to them. One of the great things about a blog is that it's a way of making a connection with people who are your readers and people who are following you for a long time."

One of the world's most popular scientist bloggers is Paul Zachary Myers, known as PZ, a biology professor at the University of Minnesota in the USA. He blogs at *Pharyngula* (scienceblogs.com/pharyngula), a site named for a particular stage in development shared by all vertebrate embryos. "Passion is an important part of this. If you can communicate a love of the science that you're talking about, then you're a natural for blogging," he explained. "[*Pharyngula*] is a blog where I have chosen just to express myself, so self-expression is the goal and what I write about are things that annoy me or interest me."

Myers' blog, which is driven by a mix of opinion, colourful science writing, campaigning against creationism and an unflinching approach to topics about which he is passionate, draws about 3 million visitors a month. He said his blog attracts more traffic than other blogs because it is not purely about science. "I do a lot of very diverse things such as controversial religious

stuff and politics, and whatever I feel like. So I tap into a lot of interest groups and that builds up my rank quite a bit. I'd say there are quite a few other science blogs out there that are pure science blogs, but pure science blogs—where they just talk about science and nothing but science—cannot get quite as much traffic as a more broadly based blog."

In an example of his sometimes-incendiary posting, Myers recently took on the *Journal of Cosmology* regarding an article on the discovery of bacteria fossils in a meteorite. He said that the counterattack got personal, but that he usually enjoys "the push back" from readers. "That's part of the argument. I would say that everyone has an equal right to make their case on the web. That's sometimes daunting for some people, but I think it's part of the give and take of free speech. It's good. It's actually kind of fun to get into these arguments."

Beyond the circus that can surround blogs such as *Pharyngula*, scientist bloggers are debating whether their blogging counts as a professional activity. Redfield said that blogging can be taken into account among the outreach some governments now require from researchers who receive public funds. She said that some researchers now list their blogging activity in their efforts to communicate science to the public.

Coyne, however, does not share his interest in blogging with other senior faculty at the University of Chicago, because he does not believe they value it as a professional activity. Still, he said that he recognizes the names of famous scientists among his blog readers and argues that scientists should consider blogging to hone their writing skills. "Blogging gives you outreach potential that you really should have if you're grant funded, and it's fun. It opens doors for you that wouldn't have opened if you just were in your laboratory. So I would recommend it. It takes a certain amount of guts to put yourself out there like that, but I find it immensely rewarding," he said. In fact, Coyne has had lecture and print publishing opportunities arise from his blogs.

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Redfield said she finds blogging—even if no one reads her posts—a valuable way to focus her thoughts. "Writing online is valuable at all levels for people who choose to do it. Certainly, by far the best science writing happening is in the community of writers who are considered bloggers," she said.

In terms of pay, science blogging usually remains in the 'hobby zone', with pay varying widely from nothing at all to small amounts from advertising and web traffic. 'GrrlScientist', an American-trained molecular evolutionary biologist based in Germany, who prefers to go by her *nom de blog*, has been blogging for seven years. She writes the popular *Punctuated Equilibrium* blog (www.guardian.co.uk/science/punctuated-equilibrium) for *The Guardian* newspaper in the UK, as well as *Maniraptor* (blogs.nature.com/grrlscientist) for the Nature Network, and is co-author of *This Scientific Life* (scientopia.org/blogs/thisscientificlife) for the science writing community Scientopia. She said she earns a small amount from ad impressions downloaded when her blog is viewed at *The Guardian*. On the other end of the scale is Myers, who declined to disclose his income from blogging. "It's a respectable amount. It's a nice supplement to my income, but I'm not quitting my day job," he said.

Yet bloggers tend not to do it for the money. "I know that when I go to give talks, the fact that I have the blog is one of the first things that people mention, and lots of students in particular say that they really enjoy the blog and that they're encouraged by it," Carroll explained. "Part of what we do is not only talk about science, but we act as examples of what it means to be scientist. We are human beings. We care about the world. We have outside interests. We like our jobs. We try to be positive role models for people who are deciding whether or not this is something that they might want to get into themselves one day."

The rise of the science blogosphere has not all been plain sailing. Although the Internet has been hailed as a brave new world of writing where bloggers can express themselves without interference from editors or commercial interests, it has still seen its share of controversy. The blogging portal *ScienceBlogs* was the launchpad for some of the best and most popular writers of the new generation of science bloggers, including Myers and Zivkovic. But an incident at *ScienceBlogs*

shook up the paradise and raised journalistic ethical quandaries.

In July 2010, a new site, *Food Frontiers* (foodfrontiers.pepsicoblogs.com), appeared on *ScienceBlogs*, sponsored by PepsiCo, the makers of the popular drink. The blog featured posts written by the beverage maker's representatives and was blended in with the other blog content on the portal. "Pepsi's blog looked like my blog or PZ's blog," Zivkovic explained, "with no warning that this was paid for and written by Pepsi's R&D or PR people [...] talking about nutrition from a Pepsi perspective, which is a breach in the wall between advertorial and editorial. The moment the Pepsi blog went live, about 10 bloggers immediately left." He said that the journalist-bloggers in particular pointed to a break of trust that would sully the reputation of *ScienceBlogs* writers and confuse readers.

In his final blog at the site, titled 'A Farewell to Scienceblogs: the Changing Science Blogging Ecosystem', Zivkovic nailed the danger of the 'Pepsigate' incident to the validity of the blogosphere. He wrote: "What is relevant is that this event severely undermined the reputation of all of us. Who can trust anything we say in the future? Even if you already know me and trust me, can people arriving here by random searches trust me? Once they look around the site and see that Pepsi has a blog here, why would they believe I am not exactly the same, some kind of shill for some kind of industry?" (scienceblogs.com/clock/2010/07/scienceblogs_and_me_and_the_ch.php). Myers, who at the time was responsible for more than 40% of the traffic at *ScienceBlogs*, went 'on strike' to protest. In the aftermath, the Pepsi blog was pulled.

Redfield raises another interesting word of caution. "Most scientists are extensively worried about being scooped, so they're scared to say anything about what's actually going on in their lab for fear that one of their competitors will steal their ideas," she said. In this context, social networking sites such as ResearchGate (www.researchgate.net; Sidebar A) might be a more appropriate avenue for securely sharing ideas and exchanging tips and information because it enables users to control who has access to their missives.

Carroll, on the other hand, who has been blogging since 2004, said that physicists are very comfortable about publicly sharing research papers with colleagues online. "The whole discussion gets very heated

Sidebar A | ResearchGate—social media goes pro

Whenever she is looking for ideas for a research project, biologist Anne-Laure Prunier, who works in the Department of Cellular Biology and Infection at the Institut Pasteur in Paris, has recently turned to ResearchGate (www.researchgate.net), the scientists' version of the social networking site Facebook. "Every time I have used ResearchGate, I found it really useful," she commented.

ResearchGate, based in Berlin, Germany and Cambridge, USA, is a free service that launched in January 2009. It was co-founded by Ijad Madisch, who earned his MD and PhD from the University of Hannover's medical school in Germany and is a former research fellow at Harvard Medical School. He explained that his goal in starting the network was to make research more efficient. "During my research in Boston, I noticed that science is very inefficient, especially if you're doing an experiment and trying to get feedback from people working on the same problem. You don't have any platforms, online networks where you can go and ask questions or if you're trying to find someone with a specific skill set. So I decided to do that on my own."

As a result, the site offers researchers functionality similar to Facebook—the modern template for social networking. Through ResearchGate, members can follow colleagues, be followed by those interested in their research, share their conference attendance and recent papers—their own or those that interest them—and most importantly, perhaps, ask and answer questions about science and scientific techniques.

"You can get in touch with a lot of different people with a lot of different backgrounds," Prunier explained. "When I have a very precise technical question for which I don't find an answer in my institute, I turn to ResearchGate and I ask this question to the community. I have done it three times and every time I have gotten a lot of answers and comments, and I was able to exchange information with a lot of different people which I found really useful."

By May 2011, ResearchGate had reached one million members across 192 countries. The largest numbers of registrations come from the USA, the UK, Germany and India. Biologists, who are second only to medical doctors on the site, make up more than 20% of members. In addition to blogging, ResearchGate is just one example of how the Internet—originally invented to allow physicists to share data with one another—is changing the way that scientists communicate and share information with each other and the public.

and very deep in some places about open access publishing. Physicists look on incomprehensibly in fact because they put everything for free on line. That's what we've been doing for years. It works." But he said they are more cautious about blogging for a general audience. By contrast, he believes biology is especially well-suited to being blogged. "[Biologists are] actually more comfortable with talking to a wider audience because biology, whether it is through medicine or through debates about creationism or life on other planets or whatever, gets involved with public debate quite often."

Zivkovic agrees: "PZ [Myers] and me and a number of others are interested in reaching a broad lay audience, showing how science is fun and cool and interesting and important in various ways. Connecting science to other areas of life, from art to politics and showing the lay audience how relevant science is to everyday life". Even so, he pointed out that although blogging is popularizing science with the public, there is a less-mainstream

sphere serving professional scientists as a forum for surviving the cut and thrust of modern science. "There is a strong subset of the science blogosphere that discusses a life in science, career choices, how to succeed in academia [...] A lot of these are written by people who [...] believe that if their real names were out there it could jeopardize their jobs. They're not interested in talking to lay audiences. They are discussing survival techniques in today's science with each other and providing a forum for other young people coming into science."

Ultimately, whether you read popular science blogs, trawl deeper for survival tips, or write your own, the science blogosphere is expanding rapidly and is likely to do so for years to come.

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