



Stine Bjerkestrand (born 1972) is Development Editor of the Journal of the Norwegian Medical Association and has a cand. mag. degree in the subjects journalism, media studies and political science.

Photo: Einar Nilsen

One of the fundamental pillars of scientific publishing, peer review, has met with a real challenge. From a blogger.

Open science

December 2010. The recognised peer-reviewed journal *Science* publishes online what they claim to be a revolutionary study. The NASA researcher Felisa Wolfe-Simon and her collaborators have discovered a bacterium that can grow on arsenic instead of phosphorus (1). This finding could be crucial for the quest for life on other planets. NASA has announced a press conference to present the extraordinary findings (2). However, the response does not prove to be as NASA and *Science* had foreseen.

Fairly immediately, the study encounters criticism from peers in social media. There are doubts regarding the results as well as the methodology. The criticism implies that the peer review has not been up to standard. Foremost among the critics is the microbiologist and blogger Rose Redfield at the University of British Columbia in Vancouver. Redfield is an activist in the open-science movement. She replicates the study «live», by continuously blogging about her experiments and the resulting findings (3).

The criticism also reaches the columns of *Science*, and in June 2011 the editor publishes a brief commentary along with all the letters from readers (4). Wolfe-Simon is given the opportunity for a rejoinder. The article is not withdrawn, but the editor points out that in spite of Wolfe-Simon's response certain unsolved issues remain, and that this is only the start of a more protracted process. In December 2011, the journal *Nature* lists Rose Redfield among the ten most influential natural scientists of the year (5). In the autumn of 2011 she appears as keynote speaker at the international conference Science Online in London, where she is greeted like a rock star. One of the fundamental pillars of scientific publishing, peer review, has met with a real challenge – from a blogger. This case is only one example of how scientific articles now undergo substantial assessment in social media – after publication.

The voluntary arrangement for peer review is often criticised by science bloggers for being a source of delay. Research results are outdated before they can be published. This viewpoint has also been put forward in *Aftenposten* by Petter Gottschalk, Professor at the BI Norwegian Business School. The discussion about openness and efficiency in peer review is not a new phenomenon, and has featured in our journal on several occasions (6, 7). Now, the pace of technological development and the proponents of open science are letting the debate progress to the trial stage.

The open-science movement claims that the model involving secret processes until the publication of articles in traditional journals needs to be modernised. They call for openness at all stages, from the collection of data until peer review and publication (8). Via the Internet, data can easily be collected, for example by way of surveys, and made available to others on an ongoing basis. Anybody can publish his or her own blog, where comments can easily be entered. Input from peers and so-called collective intelligence can help improve research quality throughout the entire process.

In other words, this involves more than just open access to the article itself. We can notice the same tendency in journalism. Readers contribute to the collection of data and the narration of the story, and background information is made available to the readers online in open-journalism projects. The UK broadsheet *The Guardian* is one of the proponents of this trend (9).

In our journal, we participate in trials of the new opportunities provided by technology. In May 2012, the traditional letter to the editor finally took the plunge into the age of social media, when we introduced a field for comments in the online issue. The discussion increases in value when it takes place in direct interrelation with the index article. The online version of the article is also the archive version, and all viewpoints in the response field are stored along with the article.

In accordance with the principles of open science, several web-based journals have a considerably lower threshold for approval than we have. However, if the rate of refusals is low, or where the research is reported in a blog on an ongoing basis, the requirements for subsequent professional debate and assessment are high. Leaving all assessment to the time after publication is a questionable strategy, especially since we know that medical journals are read not only by experts and peers. The articles may give rise to news headlines and viral distribution through social media without any critical questions having been asked.

In July 2012, *Science* published an article in which Redfield and collaborators replicated the original arsenic study (10). Blogging during the research process was no obstacle. Openness and assessment prior to publication became supplements to traditional peer review and editorial facilitation. We are at a time when traditional approaches to publication are being challenged by technology as well as principles of openness. Researchers and journal editors may act as passive spectators, or else actively use and define the premises for use of the new technology.

References

1. Wolfe-Simon F, Switzer Blum J, Kulp TR et al. A bacterium that can grow by using arsenic instead of phosphorus. *Science* 2011; 332: 1163–6. E-publisert 2.12.2010.
2. Pressemelding fra NASA 2.12.2010. www.nasa.gov/home/hqnews/2010/dec/HQ_10-320_Toxic_Life.html [22.3.2013].
3. Rose Redfields blogg. <http://rrresearch.fieldofscience.com/> [22.3.2013].
4. Alberts B. Editor's note. *Science* 2011; 332. doi: 10.1126/science.1208877. E-publisert 27.5.2011.
5. Butler D, Callaway E, Hayden EC et al. 365 days: Nature's 10. *Nature* 2011; 480: 437–45.
6. Aavitsland P. Kritik uten hemninger. *Tidsskr Nor Legeforen* 2008; 128: 1377.
7. Børheim J, Frich JC, Gjersvik P et al. Tidsskriftet, ekstern fagvurdering og medisinsk publisering. *Tidsskr Nor Lægeforen* 2006; 126: 20–3.
8. Gezelter D. What, exactly, is open science? The OpenScience Project-blogg. www.openscience.org/blog/?p=269 [22.3.2013].
9. Rusbridger A. The Guardian: a world of news at your fingertips. Inside The Guardian blogg. www.guardian.co.uk/help/insideguardian/2012/feb/29/open-journalism-at-the-guardian [22.3.2013].
10. Reaves ML, Sinha S, Rabinowitz JD et al. Absence of detectable arsenate in DNA from arsenate-grown GFAJ-1 cells. *Science* 2012; 337: 470–3.