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## **Science blogs in research and popularization of science: why, how and for whom?**

by Antoine Blanchard (Deuxième labo / C@fé des sciences)

As the Internet emerged as an efficient channel for sending information and fostering collaborations on a global scale, this unanticipated phenomenon paved the way for a new era of science, namely e-science or digital scholarship [Borgman, 2007]. Massive data repositories moved online, academic publications (preprints and articles alike) became searchable across disciplinary boundaries, collaborations grew larger. But the Internet is now developing into so-called web 2.0, where active participation is replacing passive broadcasting: every user can become their own media maker and share videos, images or text. To date, the most popular form for the latter are blogs (short for web-logs). The blog format was originally used for online diaries but has rapidly evolved into a versatile publication and conversation tool.

This shift is also being embraced by scientists, on a limited, albeit growing scale. First isolated, then grouped in communities, science bloggers (I use the term to include professional scientists as well as students, journalists, science amateurs, science museums, concerned groups...) have already demonstrated the potential to influence how research is done, results are communicated and the public is reached. Among the many topics that blogs discuss, I will focus here on science and the academic life, thus defining a type of “science blogging” that is effectively turning digital scholarship into conversational scholarship [Gregg, 2006]. But in concrete terms, how is that different? And where might this evolution be leading us? I try to shed some light on the matter in the following pages.

### **Why blog?**

In 2008, an informal survey originating from the Scienceblogs community<sup>1</sup> was circulated among blogs, prompting for everyone's personal motivations for science blogging. Dozens of English and French-language science bloggers answered the survey on their blogs. Their answers provide a broad view of the commonly avowed reasons why people blog on the subject of science. Three main reasons stood out.

First, science bloggers find it rewarding to build an online identity, primarily aiming to convey their expertise, passion, and willingness to engage in debate. It affords them recognition (for instance when they post comments on others' blogs). It also influences the chance of their blogs being indexed by search engines and holds the attraction of possibly gaining some virtual fame or notoriety. Internet visibility may even transfer into the “real world” as the credibility of blogging as a means of exchange grows. There are now many examples of science bloggers who have been solicited by more traditional forms of media to comment on latest news or invited to address live audiences. Online presence used to take the form of personal websites that at best included a standard template for email responses. This form now falls behind these easier to use and more interactive blogging tools. Once present on the web, a blogger can start to build his or her communication network, combining the use of blogs with a vast array of other social networking tools that can be more or less tailored towards the communication, distribution and/or organization of information according to his personal tastes. (As just one purely hypothetical example to

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<sup>1</sup> <http://scienceblogs.com>

illustrate the diversity of uses; these days a researcher might make professional use of a microblogging tool<sup>2</sup> to keep colleagues updated on daily activities and organize meet-ups at international conferences; a social bibliographic management tool<sup>3</sup> to store and share scholarly articles; a visual media archive of cutting edge educational material<sup>4</sup>; a collaborative wiki to organize the laboratory's knowledge<sup>5</sup>). In general, bloggers themselves see this gamut of tools as an online version of the familiar picture of informal networking over a coffee or in conference hallways, albeit on a larger scale and with more diverse forms of engagement. That is to say, they are generally well aware that science blogging is an *additional* tool for the inquisitive mind, not a miraculous way to short cut the often mundane, daily grind of the structured, methodical component that demands will, resolution, patience, and is essential to all good research practice.

Second, science bloggers strive to make up for what they perceive as a lack of openness or transparency in research practice. Traditionally, science is portrayed as a purely methodic progress towards enlightenment, through logic and continuous discussion. Instead, science bloggers try to show other facets of what it is like to work in a laboratory and to report on the dynamic process of research in action, as seen from the front line, rather than as inferred from the publication narrative or with the hindsight of historical perspective. By creating an open forum of peers, they insert science blogging into the larger movement of open science, which also includes initiatives such as open access (article repositories or open access journals), open laboratory notebooks and open research data. Whilst the many goals and impacts of open science go beyond the scope of this paper, it is worth noting that science blogs solve one problem that was raised by the famous physicist Richard Feynman in his Nobel lecture in 1965<sup>6</sup>: “We have a habit in writing articles published in scientific journals to make the work as finished as possible, to cover all the tracks, to not worry about the blind alleys or to describe how you had the wrong idea first, and so on. So there isn't any place to publish, in a dignified manner, what you actually did in order to get to do the work”. On science blogs, such content can find its right place.

Third, reaching out to the public at large is a high priority among science bloggers who, echoing sentiments recently expressed in print by Michel Claessens of the European Commission Research Directorate (Claessens 2009), often find unsatisfactory the way or the frequency at which science is covered in the mainstream media. Many science bloggers see themselves as public educators, trying to raise the level of discussions e.g. on climate change or evolution [Goldstein, 2009]. In France, for example, Sylvestre Huet, a science journalist with a regular short column in the newspaper *Libération* used his blog to expand coverage on the controversy over the causes of climate change and the role of the sun. This campaign, echoed by several other blogs, was sparked by a debate at the French Académie des Sciences. Researchers engaging with the wider public meet a clear demand: according to an Eurobarometer survey published in December 2007<sup>7</sup>, “the majority of the EU27 population prefer that scientists (52%), rather than journalists (14%) present scientific information”.

Other motives for science blogging that were much less explicit in the survey answers but are also important considerations include editorial freedom and adequate personal knowledge management. Bloggers feel the web spaces they create allow them to reclaim the power that they think the community has ceded to the journal editors and research institutions. They decide on their editorial policy, they set their own rules and beyond mere writing, they devise a recommendation tool that points to scientific articles, blogs (the so-called “blogroll” in the left or right column) or any other

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<sup>2</sup> eg. <http://twitter.com/>

<sup>3</sup> eg. <http://www.citeulike.org>

<sup>4</sup> eg. <http://www.scivee.tv>

<sup>5</sup> eg. <http://openwetware.org>

<sup>6</sup> [http://nobelprize.org/nobel\\_prizes/physics/laureates/1965/feynman-lecture.html](http://nobelprize.org/nobel_prizes/physics/laureates/1965/feynman-lecture.html)

<sup>7</sup> [http://ec.europa.eu/public\\_opinion/archives/ebs/ebs\\_282\\_en.pdf](http://ec.europa.eu/public_opinion/archives/ebs/ebs_282_en.pdf)

online or offline material. As opposed to the overarching goal of preserving scientific record, the blogger can even decide to contribute content of a more ephemeral nature to the so-called “web stream” and invent new forms of expression, as is the case in the development of microblogging tools such as Friendfeed<sup>8</sup> or Twitter<sup>9</sup>. Several of the science bloggers who responded to the survey on science blogger’s motivation described using their blogs to “clarify ideas” and felt that by writing (and doing the research necessary to write a thought-out piece for their blog), they learned the topic better. Additionally, once they had blogged about a topic, they were able to more easily re-locate and re-use that information they had acquired, than if they had just bookmarked a page or saved a copy.

After this introduction to the generalities of science blogging, I now want to dive into the two main genres that make it up: blogging for research and blogging for science popularization.

## **Blogging for research**

By “blogging for research” I refer to bloggers who are recording their work for themselves and other scientists. The process is often misleadingly viewed as synonymous with “documenting research on blogs”, i.e. a way to report on someone's progress in their reflections or experiments, combining thoughts on the process along with hard data generated by the experiments. However, as the “hardcore details” are often missing, one would be led to consider this documentation either imperfect or implicit. Instead, it appears that we should not mistake the map for the territory; as blogger Jill Walker wrote back in 2003<sup>10</sup>: “Blogs aren’t about documentation, they’re about doing, thinking and discussing. And they’re about catching fleeting thoughts and making them explicit” [Walker, 2006]. Some research bloggers post their new ideas or their responses to published articles when they think these are important but do not need a traditional publication. Likewise, science bloggers prefer to post responses to research articles if sending a letter to the editor of the journal is simply too cumbersome. Many broad-based, pre-blogging era, research publications such as *Nature*, *Science*, *Cell*, etc have, since 2006 or so, tacked online blogging sections onto their own internet presence. Among journals created post-blogging era, (in particular those specializing in areas of interdisciplinary interest) many have recognized the advantages of integrating the blogging process at more fundamental levels of their structural organization. Science in the making is brought to a new dimension as science blogs foster collaboration, interdisciplinary dialogue and dissemination at an unprecedented level and with unprecedented speed.

Of course not all of the new forms of rapid communication network between professional research communities come under the explicit name of a *blog*, but the principles are similar even if the precise goals are not always the same: recently for instance, among the publicly accessible discussion threads of a mailing list used within a specialist research community, a long series of fairly heated but productive exchanges about a newly commercialized research resource took place over a single week<sup>11</sup>. The discussion’s original participants included students, post docs and group leaders from across the globe. Once underway even Nobel prize-winners Paul Nurse and Tim Hunt joined in. This particular debate brought to more general attention a long-simmering issue, which although of no importance to the broader public and of little interest to the publishing world, is ultimately a detail of paramount importance to the scientific edifice.

The first point of blogging, as I have argued above, is often to become visible and be read, or at least noticed. In a scientific world where people judge each other based on their merits and actual

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<sup>8</sup> <http://friendfeed.com>

<sup>9</sup> <http://twitter.com>

<sup>10</sup> <http://jilltxt.net/?p=184>

<sup>11</sup> <http://lists.sanger.ac.uk/pipermail/pombelist/2009-October/000613.html>

know how, demonstrating one's expertise by blogging can constitute a first step of being recognized as someone worth listening to. If a blogger is able to elicit other people's comments and various online interactions, he can move seamlessly to networking and the construction of social credibility. As a matter of fact, bloggers increasingly use these backchannels to connect with like-minded or complementary people and carry on research projects that would have seemed impossible or painful before [Patil, 2009a]. In the spirit of web 2.0, such collaborations are highly volatile and most often disaggregate as soon as they reach a conclusion. Some researchers also noted that blogs, either open or under restricted access, can serve as useful collaboration tools within research groups, allowing them to keep up with the progress of a project and collectively build a memory that comprises not only the original ideas (blog posts) but also the comments and discussions that they sparked<sup>12</sup>.

Bloggers writing "fieldnotes in public" [Wakeford, 2008] benefit most from the readers' comments, which add to their own perspective and can improve their research. The example of philosopher John S. Wilkins is meaningful: his blog<sup>13</sup> on the philosophy of biology attracts a wide readership interested in topics ranging from the concept of species to the institution of academia or the creationism movement. In 2006, he ran a series of 5 blog posts about ongoing research on the concepts and causes of microbial species' existence<sup>14</sup>. His posts received 7 comments, a modest figure albeit quite significant in these early days of science blogging. The comments however linked to further resources and fueled a discussion that spanned quite an interdisciplinary spectrum, encompassing philosophy and microbiology alike. In his 2007 article published after some significant revision, in the academic journal *Studies in History and Philosophy of the Life Sciences*, Wilkins acknowledged his "blog readers for comment and discussion".

I have certainly benefited myself from the broad disciplines represented in the average audience of a science blog. For instance, as I posted some thoughts on how to portray "science in the making" rather than "science made", I encouraged my readers to comment and discuss abundantly<sup>15</sup>. Some comments asked for clarifications and pointed out unclear passages, while other suggested new examples and research for consideration. One responder noted rightly that my reflection was written from the point of view of a sociologist of science and he constructively pointed me to related works in the field of museology. I broadened my research accordingly and felt this helped me make a more general and robust point.

We call "crowdsourcing" this process of deferring to readers or online contacts (the more the better) for answering a question, recommending resources or contributing a piece of their expertise. Be the question straightforward ("Is this scientific article that was just published any good?") or more complex ("What should I read that is most relevant to what I do?"), the combination of so many answers provides "human filtered information" that is less prone to subjective bias. This can be highly useful in an era where one individual cannot hope to accumulate first-hand knowledge (tailored to one's needs or centers of interest) of every subject direct from its authoritative source. Websites such as Postgenomic<sup>16</sup>, Nature.com Blogs<sup>17</sup> or Streamosphere<sup>18</sup> tap into this collective mind to dig up the most popular science news or science articles as reported in the blogosphere. They can be more finely customized and Patil & Siegel [2009b] argue that they are often wiser than the traditional way of post-filtering the literature, based on expert recommendations (typically "editor's picks" of some top journals), reading habits and keyword searches.

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<sup>12</sup> <http://precedings.nature.com/documents/39/version/1>

<sup>13</sup> <http://evolvingthoughts.net>

<sup>14</sup> [http://scienceblogs.com/evolvingthoughts/2006/06/on\\_microbial\\_species.php](http://scienceblogs.com/evolvingthoughts/2006/06/on_microbial_species.php)

<sup>15</sup> <http://www.enroweb.com/blogsciences/index.php?2008/05/31/261>

<sup>16</sup> <http://www.postgenomic.com>

<sup>17</sup> <http://blogs.nature.com>

<sup>18</sup> <http://streamosphere.nature.com>

## Blogging for popularization of science

Participating at a panel discussion on science blogging, the blogger with pseudonym *Grrl Scientist* reported on the statistical makeup of her readership<sup>19</sup>: "two-thirds of my visits come from .edu or .gov sites. Primarily from educational institutions of some sort. Some people from the Senate read my blog, a lot of publishers read my blog, some lawyers... a few people who admit they're on Wall Street. I get people [aged] from 15 to people who are grandparents. I also have a classroom that reads my blog on a regular basis." Fellow blogger Brian Switek said that he makes an assessment of who is reading his blog by the types of comments he receives. For him, these are evenly divided between people who are studying science and those who are there to understand science, or those who want a "spoon-fed explanation" of the details.

The diversity of the audience is definitely a strong argument for the utility of science blogs. Whereas science museums and festivals reach a well-identified public, anyone with an internet access can find themselves reading a science blog after a Google search or while musing on the internet, in addition to its core readers who have established habits in the science blogosphere. Blogs are therefore a natural venue for popularizing science and engaging with the public at large. The engagement can take as many forms as the blogs themselves, ranging from comments on science news as reported by mainstream media to descriptions of, or comments on, pieces of current research from the very laboratory of the blogger. Others like to write educational pieces (e.g. a primer on the theory of evolution<sup>20</sup> or the purpose of the Large Hadron Collider<sup>21</sup>) or to highlight the science in a recent movie<sup>22</sup> or court decision<sup>23</sup>. History of science is often part of the mix, along with a tone that can be strident, sober, chatty, friendly... [Goldstein, 2009].

The content of science blogs can be very close to what one would expect from a science journalist. First, because some bloggers are actually professional journalists. Second, because less and less coverage remains the unique property of the journalists, as Bora Zivkovic a long time science blogger, argued in March 2008<sup>24</sup>: breaking news, be it the death of a famous scientist or the detection of water by Mars Rover, does not need much accompanying detail and can spark the interest of many people on its path to the mainstream media; the transmission by blogging of anticipated reports, such as the scheduled publication of a breakthrough paper or discussions at a scientific conference also increases the reach of such information to people in the right specialist community; news analysis is like second nature to bloggers with the right knowledge and the ability to find and parse through sources traditionally regarded as authoritative, such as academic or industrial scientists; even investigative reporting is taken on by the community of bloggers, For example, blogging recently blew up a case of plagiarism in dinosaur paleontology<sup>25</sup> and played an important role in the positive outcome of the case of the Bulgarian health care workers sentenced to death in Libya for allegedly infecting hundreds of children with the HIV virus<sup>26</sup>.

However, there are two main differences between science blogs and the traditional way of reporting and popularizing science. The first difference is that blogs allow conversations to develop, from one blog to another but also with the readers leaving comments—while public outreach used to be unidirectional. On science blogs, people actively engage with the issues at hand, ask questions, express disapproval, while the blogger does not merely pontificate but is confronted with real-life

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<sup>19</sup> [http://www.underthemicroscope.com/index.php?option=com\\_content&task=view&id=87&Itemid=54](http://www.underthemicroscope.com/index.php?option=com_content&task=view&id=87&Itemid=54)

<sup>20</sup> eg. [http://scienceblogs.com/clock/2006/12/from\\_genes\\_to\\_species\\_a\\_primer.php](http://scienceblogs.com/clock/2006/12/from_genes_to_species_a_primer.php)

<sup>21</sup> eg. <http://science-for-everyone.over-blog.com/article-22572578.html>

<sup>22</sup> eg. <http://blog.scienceandentertainmentexchange.org>

<sup>23</sup> eg. <http://buchanan.blogs.nytimes.com/2007/05/16/the-prosecutors-fallacy>

<sup>24</sup> [http://scienceblogs.com/clock/2009/03/defining\\_the\\_journalism\\_vs\\_blo.php](http://scienceblogs.com/clock/2009/03/defining_the_journalism_vs_blo.php)

<sup>25</sup> [http://scienceblogs.com/tetrapodzoology/2008/01/aetosaurus\\_and\\_whistle-blowing.php](http://scienceblogs.com/tetrapodzoology/2008/01/aetosaurus_and_whistle-blowing.php)

<sup>26</sup> <http://www.nature.com/news/2006/060925/full/news060925-2.html>

issues that span communities. The second difference is that blogs are essentially open to anyone with an interest for a topic. They give a chance to amateur naturalists, patients investigating their disease, scientifically literate and lay people to join the conversation on an equal footing. Rather than top-down communication which effectively creates a boundary between the expert and the “non-expert”, blogs offer a blend of voices and views on topics that are often more complex and less one-sided than scientists would like to believe—a point that people editing and building the online encyclopedia Wikipedia are making more obvious everyday.

Since the inception of its short life, the Internet rapidly developed a tradition of discussion forums, where people sharing a primary interest also engage in conversations. However, while undoubtedly useful, these tend to recreate the traditional boundaries between communities and levels of expertise, and they are difficult for “newbies” to enter. In contrast, blogs offer a more appealing narrative combined with a less intimidating, informal style that sparks broad discussion and makes it easier for the initially passive, or the transiently interested reader, to feel concerned enough to respond.

## **Blogging without boundaries**

For the purpose of clarity, I have distinguished between two main objectives of science blogging even though an inherent characteristic of blogs is that they blur the categories that one tries to impose onto them. For example, the genre of science blogging often combines writings about the context as well as the content of research, making fuzzier the distinction between science *as a process* and science *as a set of results*. To illustrate my point I draw again from Jill Walker’s experience in blogging about literary studies, [Walker, 2006]: “What I ended up writing was a hybrid genre, my favorite kind of research blog: the blog that both discusses the content of research, the ideas themselves, and that also discusses the process and experience of researching.” These distinctions are important ones for me as I feel that traditional science communication is too often the communication of a corpus of scientific knowledge and too rarely the portrayal of a human endeavor. Reflexivity on scientific practices is embedded in blogs as a process.

Scott L. Montgomery noted that “the online world not only opens science to wider participation and to new expressive forms, but by doing so it shows that the boundaries once assumed to divide scientific endeavor, in its essence, from other domains such as politics, economics, and the wider contemporary culture, are largely mirages” [Montgomery, 2009]. Instead of making an artificially reductionist choice between addressing a restricted public of peers to communicate as part of the process of knowledge production or to disseminate science to less-partisan audiences, in different venues each following a different set of rules, bloggers can express themselves and build a mixed audience that makes no prior assumption of who shall be interested, who shall read and who shall respond. It breaks down many walls of the academic ivory tower and renders “the flow of ideas that circulate in an institution or disciplinary sector, more publicly available”<sup>27</sup>, for anyone to see, benefit from, or challenge. In science just like in every other academic field, this can make a difference: for instance Professor Douglas A. Berman estimates that only about a half-dozen of his more than 50 law review articles and commentaries have ever been cited in judicial opinions, whereas his popular blog has been cited in more than a dozen legal cases, “including a dissenting opinion in a 2005 landmark decision by the U.S. Supreme Court”<sup>28</sup>.

Science in the making gives often an unpredictable, or unanticipated perspective on science practice and science theory, revealing their natural messiness and flaws and reminding us that by definition they can never be perfect or absolute. Science blogs allow us to peep through laboratory doors and

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<sup>27</sup> <http://www.lukegilman.com/blawg/2006/07/31/blogging-in-higher-education-the-invisible-college>

<sup>28</sup> *Idem*

realize that the progress of research is more important to our daily lives than the “cold science” that has been canonized by the institution. As nanotechnologies find themselves at the heart of social controversies, the issue of climate change is being reframed by stakeholders, and stem cell research questions our ethical guiding principles, science can no longer wait for knowledge to be stabilized before making its voice heard. In risk societies transformed by complex issues, there is little hope in keeping the science in a safe place—while researchers stand at the front of heated debates and tireless negotiation work. Blogs maintain no such illusion.

The personalization of science blogging and the first hand accounts of research that it provides also help shift the interest from the content to the meta-discourse around it: who says what, in which context, based on which assumptions... This has traditionally been ignored in science communication, in spite of sociological work that has shown how much “backstage information” is critical to fully apprehend a scientific debate [Martin, 2000]. Similarly, the discussion pages in Wikipedia makes visible the scaffolding of such intellectual edifice as an encyclopedic article.

Interestingly enough, the dialogic form that characterizes science blogs is common to both research and (modern) popularization of science. Scientific peers routinely engage with each other to build intersubjectivity, while recent moves to restore public trust in science since the mid-1990s have come in the form of national public dialogue initiatives, like the “GM Debate”<sup>29</sup> or “Nanodialogues”<sup>30</sup> in the UK. Therefore, I believe that science blogs constitute the ideal candidate for a new communication channel, that naturally brings the scientists and researchers closer to their diverse audience, while inducing the public to participate more actively. Decades after sociologists of science convincingly demonstrated that formal communication and popular science represent the two ends of a continuum rather than a radical dichotomy [Shinn, 1985], it is more than high time to take action and explore new avenues that shove aside the usual categories.

## Some (success) stories

Are success stories necessary to show the benefit of science blogging? There is a strong demand for it, even though it contradicts most of the central purpose of blogging. Blogging means building a long-term relationship with the readers, developing a shared understanding of what it is like to work in science or caring about science in the 21st century. In all but some high-profile cases, blogging is about small things, almost intimate. As Jill Walker puts it [Walker, 2006]: “Blogs (...) are inherently social. Whether you have five readers or five hundred doesn’t really matter, it’s the knowledge that this will be read that is important. For a very new scholar, used to a world where three people will read a paper, grade it, and then put it away forever, that is an exhilarating and frightening idea.”

When I started blogging as an MSc student in social studies of science in 2006, one of my goals was to show the readers what this field is like, what its stakes are, what it is trying to achieve. Over several hundred of posts, I delved into scientific frauds and ethics, the mechanisms of peer-review and publication, the relations between scientific expertise and democracy, the politics of technology, the robustness of scientific claims<sup>31</sup>... Nothing spectacular, but rather my individual attempt to shed some lights and build a conversation on a modest scale. During the protests that marked the academic year 2008-2009 in France, when academics tried to resist some political decisions that they thought were detrimental to the quality of their research and teaching, this community realized how its voice was hardly heard. They could not get their points across mostly because the stakes were complex and because they were victims of the “ivory tower” syndrome. This led to political discussions on how academic bloggers, by slowly changing the way they are

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<sup>29</sup> <http://www.food.gov.uk/gmdebate/?view=GM+Microsite>

<sup>30</sup> <http://www.demos.co.uk/publications/nanodialogues>

<sup>31</sup> <http://www.enroweb.com/blogsciences>

seen and inviting more and more lay reader to enter their world, could change this situation<sup>32</sup>.

The measure of success on science blogs consists first of all in the blogger's satisfaction with their writing and their use of the tool. Then comes the fact that their words are being linked-to, commented on or marked as "liked" on various social platforms—a metric of impact that might be compared with citation indexing in traditional science evaluation. It is also stimulating and rewarding just to observe the medium expand and witness so many clever discussions develop. For instance, French blogger Tom Roud (a pseudonym) offered some thoughts in March 2009 about the invention of agriculture and the subsequent evolution of modern societies<sup>33</sup>. Over the course of one month, many readers including an anthropologist, a chemist, a computer scientist and the archeology editor of a popular science magazine joined the conversation and contributed ideas to what turned out to be an open question ie just posed for the sake of the discussion and the pleasure of the argumentation. When this primary motivation is at the heart of a professional context or exercised in conjunction with one's own research interests, it can lead to advances in the accepted canon of knowledge or to setting the scientific record straight<sup>34</sup>.

I shall exemplify one success story on the use of blogging in the context of scientific research. In January 2009, mathematician Tim Gowers started a massively collaborative mathematical project called Polymath. Given a problem that needs solving, the idea was to engage a large number of collaborators, spending each a minimum amount of time but reaching a smarter and faster conclusion thanks to the distributed diversity of creativity, skills and knowledge. After finding a problem that was amenable to this type of work, Gowers had to build a community (the readers of his blog were a good start) and find a way to make it work in an online, collaborative and transparent fashion<sup>35</sup>. The project ran for six weeks and was so successful that the online mathematical community has launched three other Polymath problems at the time of writing<sup>36</sup>. Interestingly enough, the projects make use of a blog and a wiki, i.e. a user-friendly website that anyone can edit like Wikipedia. Whereas the wiki is good at organizing knowledge, the blog allowed to keep a record of what has been done and who has done it. As one participant, who defines himself as "an amateur with just an undergraduate degree in math"<sup>37</sup> noted: "The linear format of the blog was wonderful in that it enabled my inspiration to come via observing the process of research. And the wiki was great too, since over the past two weeks I've been catching up on all of the pre-requisite math to actually understand what's going on. [A major progress of the project in the form of a mathematical proof was] a great moment for me because it solidified my whole understanding of the project—afterwards I went back and read through many of the comments again to better interpret the discussion. So to me, the real value of the project was simply that intermediate steps were being written up [on the blog], rather than the usual 'write up only when you have a paper to publish'."

## Will all scientists blog?

After stating the many advantages of science blogging, one may wonder whether this new communication medium will turn out to be the email-equivalent of the 21st century in research labs. In other words, might we see more and more scientists acknowledging "blog readers for comment and discussion" at the end of their academic publications? And prediction aside, would this be desirable?

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<sup>32</sup> See <http://www.enroweb.com/blogsciences/index.php?2009/06/02/398>

<sup>33</sup> <http://tomroud.com/2009/03/26/agriculture-economie-et-evolution>

<sup>34</sup> <http://www.rsc.org/chemistryworld/News/2009/July/27070901.asp>

<sup>35</sup> [http://scienceblogs.com/christinaslirant/2009/08/an\\_overview\\_of\\_the\\_polymath\\_pr.php](http://scienceblogs.com/christinaslirant/2009/08/an_overview_of_the_polymath_pr.php)

<sup>36</sup> <http://polymathprojects.org>

<sup>37</sup> <http://gowers.wordpress.com/2009/03/10/polymath1-and-open-collaborative-mathematics/#comment-2710>

One biologist has offered a good summary of the situation on his blog<sup>38</sup>. For him, scientists fall into two categories (although in reality there is of course a continuum between these): either they believe that “when you close a door you leave more outside than you protect inside”, or they would prefer to work in their very own niche for fear of being plagiarized or scooped. Because of this fundamental difference, the former category will naturally be more attracted to blogging and doing science 2.0 than the latter. However, as they jump on the blogging bandwagon, the influence of research institutions could weigh in. More and more of them now promote science blogging and offer official tools for their researchers to blog, e.g. the Oxford Internet Institute<sup>39</sup> or the École polytechnique fédérale de Lausanne<sup>40</sup> [Batts, 2008]. With such endorsement from the hierarchy, there is little doubt in my mind that reluctant researchers will eventually start joining the conversation. Roger Pielke, Jr., blogger at Prometheus<sup>41</sup>, a science policy blog affiliated with the University of Colorado Center for Science and Technology Policy Research, believes for example that “grounding the blog in an academic institution improves its legitimacy and reach” [Batts, 2008].

However, this trend raises many issues. First, once institutionalized, blogs need to be quality-controlled and their success gauged [Batts, 2008]—with the fear that blog metrics become another avatar of research metrics, and “metrics 2.0” based on audience, impact... end up suffering from the same biases attributed to the much criticized impact factor and citation counts. Second, blogging is fundamentally a bottom-up practice and a constant testimony of the autonomy of the research community, made of men and women rather than institutions and governments. As blogger and historian of science Thomas Söderqvist noted, borrowing categories used in political science, science blogs that are written from a first-person singular perspective represent the multitude whereas institutional science communication with a dominant perspective represents the Empire<sup>42</sup>. Therefore, the influence of power dynamics and conflict patterns within the research world are at the core of debate about the future of science blogging and should not be easily dismissed<sup>43</sup>. In fact, rather than institutional incentives, researchers might be more amenable to communitarian incentives. The short history of science blogging has shown that communities such as ScienceBlogs<sup>44</sup> in English or C@fé des sciences<sup>45</sup> in French have thrived by offering a good blend of science blogs and increasing the visibility of the whole, maintaining the momentum and allowing transient synergies between individual skills and centers of interest. In the case of the C@fé des sciences, it encouraged some members to blog outside of their *comfort zone* and dare to confront new topics—knowing that a colleague could add to the discussion or correct mistakes—as well as providing a framework in which to write joint or collective blog posts. The obvious success of bottom-up science blogs communities and their appeal to new bloggers are a critical factor in eliciting vocations.

A middle way between the marginalization and the institutionalization of science blogging is described by Shalley A. Batts *et al.* [Batts, 2008]: “if groups of bloggers were to create their own initiatives and then seek institutional recognition, they might be able to engage in conversations about science on their own terms while continually proving to the institution—as they already strive to prove to their readers and peers—that the conversations they are engaging in are worthwhile. (...) By initiating frank and open-minded conversations about shared goals, blogs and institutions can work together to advance the quality and scope of the ongoing global conversation about science we

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<sup>38</sup> [http://www.recherche-en-cours.org/REC/Blogcast/Entrées/2008/9/12\\_Science\\_2.0\\_-\\_2\\_3.html](http://www.recherche-en-cours.org/REC/Blogcast/Entrées/2008/9/12_Science_2.0_-_2_3.html)

<sup>39</sup> <http://people.oii.ox.ac.uk>

<sup>40</sup> <http://blogs.epfl.ch>

<sup>41</sup> <http://sciencepolicy.colorado.edu/prometheus>

<sup>42</sup> <http://www.corporeality.net/museion/2008/07/31/science-blogging-science-communication-and-the-multitude>

<sup>43</sup> <http://www.corporeality.net/museion/2008/09/24/science-blogging-vs-institutionally-based-science-communication>

<sup>44</sup> <http://scienceblogs.com>

<sup>45</sup> <http://www.cafe-sciences.org>

all participate in and depend upon.” Another path for normalization is the increasing use of the term “online research notebooks”, that takes “science blogs” away from the image of adolescent, intimate or controversial writings that are associated with the beginnings of blogs. As in the case of the French blogging platform Hypothèses<sup>46</sup>, under the shared responsibility of several universities and research institutes, such an approach helps give the tool a fresh image and make it institution-compatible whilst departing very little from the original idea.

Now, what about these researchers and scientists who will not succumb to science blogging in the future? Shall we observe a defining difference between the “have” and “have-not” of science blogs<sup>47</sup>? Probably not: the quality of the have-not's research should be unchanged and it is safe to say that there will always be good researchers who do not blog. However, the difference will be for the society at large, who could lose out on the *positive externalities* of science blogging if its practice does not become widespread among researchers and scientists. In economics, this notion denotes the impact of a transaction on a party that is not directly involved. For example, fire-proofing a home also improves the fire safety of neighbors. We can hypothesize that some if not most of the value of science blogs lies in the externalities: they do not only benefit the researcher who can unleash his or her passion [Wakeford, 2008] but also other scientists and the general public. Values such as openness, access and engagement that matter to the society as a whole are well put to action in the science blogosphere... and in my opinion the world would surely be a better place if all researchers blogged.

## Conclusion

Even if science blogging does not become the email of the 21st century, it is here to stay: I believe that what we make a big deal of today shall become a mainstream practice in the next decade. This will have a price: blogs epitomize freedom of speech and come with their share of harsh controversies, half-baked opinions and lazy reporting. They are also very effective rumor mills, what Matthew Chalmers exemplifies in the story of Tomasso Dorigo [Chalmers, 2009]. A particle physicist and blogger, Dorigo commented in January 2007 on a small “bump” in data taken at the US particle physics laboratory Fermilab, which he suggested could be evidence of the much sought-after Higgs particle<sup>48</sup>. This led to a two-pages story in the popular science magazine *New Scientist* entitled “Glimpses of the God particle”, which was soon picked up by mainstream publications such as *The Economist* and *Wired*. As the news spread in the blogosphere, the work that Dorigo exposed had yet to be reviewed by the 500-strong experimental collaboration of which he was part. He tried to distance himself from the story by claiming on his blog that the lack of statistical significance of the bump was not properly conveyed by the *New Scientist* journalist<sup>49</sup>. Dorigo later came under heavy fire from his collaborators, who have a strict system in place for releasing results to the wider world.

The blogosphere is also credited with a bestiary of readers and commenters that blogs users have to deal with<sup>50</sup>: the flamer who posts deliberately hostile and insulting *ad hominem* messages; the troll who posts irrelevant, controversial or off-topic comments; the kook who continually posts messages with no apparent grounding in reality; the shill who posts comments as a front for an unseen group or organization, usually at odds to the topics being discussed.

As a matter of fact, we are already learning to cope with these drawbacks and adapt to them. They

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<sup>46</sup> <http://hypotheses.org>

<sup>47</sup> <http://wiser-u.net/blog/2009/06/17/would-ramanujan-have-a-blog>

<sup>48</sup> <http://dorigo.wordpress.com/2007/01/19/a-21-sigma-eccess-of-mssm-higgs/>

<sup>49</sup> <http://dorigo.wordpress.com/2007/03/01/the-mssm-higgs-signal-buried-in-my-plot>

<sup>50</sup> <http://www.searchlores.org/trolls.htm>

are part of a bigger trend that is forcing us to rethink the current practices of research, which are as subject to the fundamental forces of change now as they have been over millennia. Be it in the way that priorities are established or collaborations arise, science will live in its century, as it always did. One day our offspring may laugh incredulously upon learning that in its early days blogging was often seen as a dangerous practice, a waste of time or, at best, a hobby—but we are not there yet. Graduate students or early career researchers are sometimes told by advisors and supervisors to stop blogging and concentrate on “real” work. This is also a reason why many science bloggers are writing under a pseudonym, which has the advantages of anonymity (you cannot be traced back to your real identity) without some of its inconvenience (ie with a pseudonym identity you can still build a clear reputation and track record on the web)<sup>51</sup>. However, this is another disruptive practice in the traditional scientific world, which generally uses an author's credentials to judge the merits of their work.

I hope that this essay has shed some positive light on science blogs and will motivate more scientists, academics, educators and citizens of the world to explore the blogosphere. One easy way to try out blogging is to do it for oneself. As a personal knowledge management tool, with timestamped entries, it can help one cope with the feeling of being subjected to excess of information and catch fleeting thoughts for the world to see. A few basic rules can help you make a good start<sup>52</sup>: choose a reputable blog host, keep privacy at heart, try to post twice a week and link to the material that you use. Inevitably someone else will come across your blog and approve, reply or comment. You will find yourself engaged in mind-expanding conversations in no time, on the very topics that matter to you. And along the way, you might find out that you are enjoying it.

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<sup>51</sup> <http://reassignedtime.blogspot.com/2008/04/pseudonymity-is-not-anonymity-duh.html>

<sup>52</sup> <http://www.scidev.net/en/practical-guides/how-to-set-up-a-science-blog.html>

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