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# Open Sesame: The Open Science and Open Date Movements and Their Implications for Librarians

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# Open Sesame:

## The Open Science and Open Data Movements and Their Implications for Librarians

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As I write this article, my suitcase sits besides me still not properly emptied after having accompanied me to the Genetic Alliance Annual Conference in Bethesda, Maryland. I spoke there on July 17, 2010, on "Science 2.0, Medicine 2.0, Health 2.0, and Open Science: The Revolution is Now."

And at the bottom of my computer screen, I see the Web site of the Open Science Summit, which will be held in Berkeley, California, July 29–31, 2010, long before you will read this article.

So what does all this have to do with libraries and librarians? More than you might think.

Before we get into the nitty-gritty of Open Science and Open Data, let's talk a little about librarians and where many of us work these days. Sometimes, it is outside the traditional library setting.

Take me (my favorite subject!), for example. I started off in the library profession in a small community hospital library. I now work in the Center for Health Research and Quality, managing two free online databases, ResearchRaven and ScanGrants. Thus, between 2004 and now, I have gone from working in a library setting—shelving books, recording arrival of hard copy journals, and dealing with people face to face—to working almost exclusively online creating Web-based resources for librarians and end-users who I will, for the most part, never meet.

Now, this not to say that I do not value library as place, and I do miss the interactions with my old boss and patrons. But my situation is not unlike what has happened to many of us in the library profession. We have discovered opportunities to develop new services and expand the range of our relationships by noting what is happening in other realms, such as science and medicine, vis-à-vis the explosion of online activity. And much of what is happening in online science and Open Science parallels what is happening in libraries.

How so? Well, just as patrons now use libraries remotely and electronically, increasingly science is done online. This could be single projects in chemistry done in the Open Notebook mode, an electronic laboratory notebook freely available and indexed on common search engines, with the processes and results open to all. It could also be huge e-science projects involving labs throughout the world, employing massive amounts of computing power and crunching what is only semi-jocularly referred to as "big data."

Whew, Open Science seems complicated! Why do I need to say so much to describe the concept of Open Science? Perhaps it is because Open Science touches on so many issues: how science is conducted, research results are disseminated and evaluated, results are translated, and ultimately clinical use, so that patients and their supporters will benefit from this faster, more powerful way of doing science.

Librarians and libraries stand to gain if we grasp opportunities to develop services that aggregate and otherwise render useful the huge amount of data that is going to be produced. Open Science is becoming the new normal, and data is becoming more open (Stuart, 2010). Science and data are becoming more open for all to utilize as each user and institution sees fit. The Obama Administration is preparing to release vast amounts of government-held raw data that everyone from start-ups to corporate behemoths is going to try to repurpose and monetize. We librarians need to get into the fray and create our own non-commercial tools and services in like but selfless public service fashion.

We could also lose out if we fail to note the development of Open Science and do not develop services that the scientific community values. Similarly, we lose if we fail to note that the scholarly article and the idea of the journal itself are not destined to forever remain the mainstays of scientific communication.

Cataloging, for instance, will become, paradoxically, more important as increasing amounts of information are produced and less important as mainstream publishing, and thus journals, decrease in power; much of the discussion in science will take place outside the realm of our comfort zone in libraries. Publication will become almost an afterthought or a matter of choice for scientists as the "publish or perish" model gives way to a model based more on open peer review and online discussion of preliminary results and less on the current, achingly-slow process of publishing in expensive journals that many libraries can no longer afford anyway.

Catalogers will have to become detectives and intelligence agents to determine where discussion is taking place, what needs to recorded, and what the final version is to be. The article is becoming less a finished, static object and more something that is forever in flux, and microcontent such as a single graph or table are becoming the key item of interest rather than an article proper.

Librarians are already very good at finding information and packaging it for our patrons. There are going to be more places where that information lies on the Web, from Open Notebooks to wikis to slideshows to conversations in scientific social networking communities to online videos. We will have to become experts in searching for such content and developing standards to preserve it. And it is not going to be easy to insert ourselves into the conversation, given that much of what librarians will want to bring up are arcane and, well, boring to scientists, whose eyes glaze over when we drone on about metadata and ontologies.

This brings me back to the conference I noted at the beginning of my article. Why else does Open Science matter to librarians, and what was I doing at talking about it to a roomful of disease advocates, health policy makers, academics in health services research and public health at the Genetic Alliance Annual Conference? What do all of those people have to do with Open Science?

Well, disease advocates tend to be passionately committed to curing diseases, or at least lessening the suffering of the afflicted. Thus, they tend to raise money for medical research. And one fascinating trend among funders, even increasingly the federal government, is to ask grant applicants not only about the aim and scope of the research but also about how they will disseminate results.

For example, starting in 2008, Autism Speaks, an autism science and advocacy organization, began requiring grantees to deposit any resulting peer-reviewed research papers in PubMed Central. This was a milestone and, one hopes, a precedent that will be adopted by other organizations. It is more bang for the funder's research dollar: the greater the number of researchers that can access results, the higher the likelihood that the results can be capitalized on and so further the aims of the original funder. And this does not even consider the PR value of having the name of one's organization spread throughout the world via downloads from open access sites such as PubMed Central.

Again, why does all of this open access (and more broadly Open Science) activity matter to libraries? Well, for one, most librarians are under pressure to cut back on journal subscrip-

tions. The more content we can acquire via open access, the better. Most of us do not have the riches of ScienceDirect at our fingertips. But we do have patrons who need solid medical information, and sometimes our only option is open access articles. As awareness of Open Science grows among funders, research results will filter down to the librarian and patron level in just a few years as opposed to many years—or never—under the current model.

And there is only going to be more pressure on funders from their own constituents (that is, the ill and their families, who want the latest and best information about their diseases) for greater openness by researchers. The open access movement for government-funded research is no longer just a matter for librarians. A tipping point seems to have been reached in the public opinion and understanding of the stakes; it is not just library journal budgets, but human lives.

What else do librarians need to know about the Open Science movement? Well, one thing we need to be able to do is develop a high tolerance for fancy sounding phrases and realize that what sounds like hype actually does force us to think about the coming revolution in scientific communication. For example, as I mentioned, I looked over the Web site of the Open Science Summit (http://opensciencesummit.com) while writing this article. Specifically, I looked at the list of presenters and came across some phrases that will assist me in explicating matters here.

Let's start with this: "conceptual and experimental toolkit and construct the foundational technologies needed to complete them." We will begin with the conceptual part of that. As librarians, we have to think of ourselves in two places at once: our physical spaces and our place in cyberspace. We have been able to make that conceptual shift even if some of us are more tethered emotionally to the reference desk than the instant messaging widget.

Indeed, in some ways, librarians have transitioned to Library 2.0 better than some scientists have to Open Science. Many scientists balk even at admitting that there is such a thing as Open Science or that peer review and tenure processes may change radically in coming years. These changes are particularly heralded by young researchers, who will ask that their writings on personal blogs and activities in virtual research environments be factored into tenure reviews.

So much for the conceptual part. What about the experimental part of the toolkit? Interestingly, as one of the leaders of the Open Science movement (particularly of the subset Open Notebook Science), Jean-Claude Bradley, points out, much of the beauty and appeal of Open Science is that it can be done with existing, free or inexpensive online tools such as Google Docs, wikis, slideshows, or open access journal software. (See Bradley's blog "Useful Chemistry," http://usefulchem.blogspot.com/, for real-world examples of Open Science in action.) Open Science then—unlike e-science, which tends to require supercomputing power or at least large teams at many major institutions—is surprisingly cost effective. Thus, the last part of that phrase, the part about foundational technologies being needed, is already in place.

Now, as library professionals, who spend a great deal of time determining the value of search results, you may be asking, "Okay, so Open Science is new. It is faster than older methods. It does not cost a lot. But is it good science? What about peer review?"

In the old days, a toll access journal ran an article through a peer review process in which reviewers' identities were unknown to authors and authors' identities were sometimes,

but not always, unknown to reviewers. Thus, the system was open to accusations of good old boyism and not infrequently led to disillusionment or distrust among new entrants onto the scene (e.g., women and minorities). This system also took an inordinately long time and did not prevent fraud adequately.

By contrast, in open peer review, the identities of both authors and reviewers are revealed and, ideally, both the paper and the comments are open to all. This transparency is unprecedented and makes even some in the Open Science community a little nervous. But it certainly brings science into the sunlight and makes it far more likely that the general public, and young people in particular, will take interest. And such interest in science can help people think analytically, recognize fallacious arguments, and improve their own observational skills. Librarians should seize opportunities to engage young people in the growing drive for undergraduate research that is project-based and not coursework-based. Some of the leaders of Open Science (such as Bradley) are also caring, innovative teachers, and those are just the kind of faculty partners academic librarians seek.

And speaking of partnerships, here is another bit of wording from the Open Science Summit Web site for us to ponder: "… Emerging biotechnologies and the Web are redefining the relationships between scientific research communities, communities from the general public, and the network of actors in-between." Librarians are the actors in-between. We are perfectly positioned to help people who are puzzled by what Open Science is, from research administrators to science educators in our local high schools. Librarianship and Open Science are both about discovery and collaboration. We know better than anyone that our current publishing models are too rigid and tend to favor the already information-rich at the expense of patients, struggling scholars, and poorer institutions. Open Science is an equalizer as well as efficiency engine.

It is also an opportunity for those librarians with the technical and trend-spotting skills to develop tools and services for its practitioners and patrons further down the pipeline whom we can serve by opening up the door to Open Science. Open Science: open sesame to knowledge and scientific advancement.

## References

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