Unmeasurable Science

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September 4, 2010

On Wednesday PLoS BLOGs launched with a splash. We (both PLoS BLOGs as a whole and me individually) got a lot of positive feedback and words of encouragement – so we are off to a good start. As both our community manager Brian Mossop and myself are currently in London for the Science Online London Conference, we could celebrate the launch in person. With a good pint of British ale Thursday evening.

Today I want to talk about something that is sticking in my head since a conversation a few weeks ago with some friends (all esteemed professors in biology or medicine) over another beer. And this has of course been discussed before, both on this blog and elsewhere. Doing science is not only about doing exciting research, and communicating the results to your peers and the public. Measuring scientific output – of funded research projects, a particular researcher, or an institution – seems to be equally important. I would argue that in recent years this has even become the most important aspect of doing science. The successful researcher of today is not necessarily a brilliant mind, skillful experimenter or successful communicator, but a good manager of science. Grants need to be written, collaborations and networks built and maintained, and papers published.

This is all good and well in the sense that researchers should be held accountable for how they are using their funding, often from public sources. And we want to fund the right projects, i.e. those that have the highest likelihood of achieving something new and exciting. But there are two very big problems with this:

We don't really know how to evaluate science, particularly in numbers that can be used to compare research projects.

This problem is aggravated by the fact that funding (and hiring) decisions are predictions based on past performance. Excellent science by definition is new and groundbreaking, and predicting scientific progress is really hard to do. The past performance of a researcher, the research environment he is working in (colleagues, scientific equipment, etc.), and of course the project outline written down in the proposal are all very helpful. But can we really predict the next Nature or Cell paper before a project has even started? And the evaluation

of scientific output is also extremely difficult. Do you just look at published papers? And if so, how do you evaluate the scientific impact of those papers? Through peer review? By the number of times they were cited? Citation counts have several problems, one of them is the fact that they take a few years to accumulate. The journal a paper is published in? How good an indicator of the impact of the individual paper is that? Should you rather look at download counts or other article-level metrics? We need to think much more about these important issues, as our funding (and hiring) decisions depend on it. I am very happy that I was invited to a workshop by the National Science Foundation this November that will talk about some of these issues. Unique digital author identifiers will play an increasing role in our efforts to tackle the technical aspects of this problem, and I will say something about the ORCID initiative.

The evaluation of science is taking up more and more of our time that is then missing time for doing research.

Before the first experiment is even started, a project has taken months or sometimes even years of grant writing and grant reviewing. The regulatory requirements are also increasing, and in the case of clinical research involving patients (something I do) can be overwhelming. After a research project is finished, paper writing and reviewing (and writing a report for the funding agency) again takes many months. In the end it might have taken us two years to do the experiments, but five years from beginning to end of the project.

If we want researchers to do more research – and less grant writing, manuscript writing and peer reviewing (because all this output has to be evaluated by someone), we have to ask funding organizations and institutions to do something about this. There are many possible solutions, and some of them have already been realized:

- Grants can be given for longer periods of time, e.g. 5 years instead of 3 years
- The review of grants could just look at the researcher, and doesn't try to predict scientific discoveries based on the proposed work
- Smaller grants, e.g. less than $50.000 don't need to have a concluding report, a link to a paper published with the results should be enough. Similarly we might need fewer progress reports in larger grants.
- Many aspects of grant and paper writing could be made less time-consuming by standardization and automation.

There is a lot of potential in the last point, and the workflow is broken at many points. Why do researchers have to list their publications in their CV, this information is publicly available? Why does every funding organization want a slightly different format for their grant proposals, can't we standardize this? Why don't we have better paper writing tools? Microsoft Word doesn't really now about the different required sections for a manuscript and is far from perfect for collaborative writing.

But I have to stop writing now, the second day of the Science Online London Conference is about to begin. I'm wearing my new PLoS BLOGs T-shirt and look forward to another great conference day. I will write about the conference in a separate post in the next fews, but for now let's just say this conference is even better than in 2009.