How Better to Use (Im)partial Scientists to Help Shape Public Policy

ARNE O. MOOERS

Biological Sciences Department, Simon Fraser University, Burnaby, BC, V5A 1S6, Canada, email amooers@sfu.ca

Key Words: public policy, academics, Canadian academies, lobbying, Royal Society, *Species at Risk Act*, SARA, letter campaign, Canada

On 10 September 2001, an open letter to Canada's Prime Minister was presented to the public at a press conference in Ottawa. This letter asked for specific changes to be made to Bill C-5, the *Species at Risk Act* (SARA). It was noteworthy because it presumed to carry the weight of the 1331 'scientists' who had signed it. Several of the specific changes outlined in this letter were eventually incorporated into the version of the Bill that is now law[1]. By this measure, the letter campaign must be deemed partially successful, at least by correlation; however, I submit that, even if this and other such campaigns are demonstrably effective, letter campaigns by scientists are very awkward instruments. After outlining my main concern as to why, I briefly consider how nongovernment scientists might inform public policy.

To begin, who are these 'scientists' who sign scientists' letters? For the purposes of the letter we submitted to the Prime Minister, we suggested that signatories have a PhD from a Faculty of Science and be employed to do what they were trained for. Though the question of what it is to be a scientist is not straightforward, both what a scientist is, and what a scientist is perceived to be, are critical to this discussion. I submit that the idea of credibility is paramount. Though scientists live in a society of their own, credibility is both the coin of their realm and their ticket to the outside world. Both colleagues and the world at large pay attention to scientists insofar as they are perceived to be credible. For the world at large, this perception is based on how scientists are perceived by other scientists (e.g., that they have positions in universities and publicly-funded laboratories, and that they publish in 'scientific' journals). Of course, in some fields, scientists are also associated with their products—e.g., medicines and space travel. Alas, with regard to biodiversity, the product is often just a dire prediction and a call for some sort of sacrifice, and so, credibility remains in the fore.

The authority gained from a history of credibility, granted in the first instance by colleagues, is tenuous. There is much consideration of 'good' science in academe, with explicit debates on the relative merits of description, hypothesis testing, strong inference, falsifiability, and the like[2]. Though different branches of science, biology, and subdisciplines within biology each have cultures that affect how one evaluates science as good or not, qualities such as creativity, parsimony, and generality are common. So too is a well-patrolled demarcation by the purveyor of science between what data do indicate and what they might indicate. Scientists have perfect pitch in this regard, as anyone who has witnessed the dissection of a scientific paper by a group of

colleagues can appreciate. What is written down cannot be ambiguous here, with the corollary that what is written down is exactly what the author intended to write down. Ventures into the realm of caveats, possibilities, and extensions must be explicitly flagged, and rhetoric is unwelcome. Scientific credibility is judged to a certain extent on this demarcation. Indeed, levels of over-interpretation can be used to help judge the difference between 'good' and 'bad' science. The extreme of over-interpretation is outright fraud, where a scientist presents fantasy as fact, usually by making up data that indicate a desired pattern and then conforming to the game by explicitly speculating on it. Examples of this are instantly notorious[3]. Less extreme, however, are instances when counter-evidence is conveniently ignored, data are 'cleaned up' and statistical tests are chosen in light of the results. This may be why colleagues pore over references, are pathologically interested in where things are published, and often agonize over statistical biases.

This cultural aversion to over-interpretation binds individual scientists with regard to public policy. To be made credible by other scientists (e.g., by making them professors at reputable institutions, and in citing their work) such that they are awarded with the opportunity to speak with authority to the public at large, they must be creative and productive in order to earn esteem but also ever vigilant when straying from the data at hand. This vigilance extends to data collected by others. Yet if scientists are to engage with the public through vehicles like open letters, they will be called on to offer authoritative opinion on matters that are beyond their own data. And here is the first knot: how can someone whose bread and butter is a continuous parsing of evidence, counter-evidence, fact, and conjecture attach his or her name to something someone else has written based on data collected by others? Multi-author papers in the scientific literature may offer an example. A famous case involved an American Nobel Prize winner, David Baltimore, who coauthored a scientific paper suspected of being fraudulent. Though there was never any suggestion that Professor Baltimore himself had been involved in any wrongdoing, his scientific credibility was at least temporarily dented[4]. Indeed, scientific societies responded to the case by drafting explicit guidelines on what constituted authorship so that coauthors could less easily hide behind an admission of ignorance[5].

While it would be fanciful to suggest that open letters to government be held to the standards of scientific literature, consider the situation: because it is unrealistic for one thousand scientists to evaluate the data upon which claims made in a policy letter are based, each contributor is asked to risk exactly what they are being asked to contribute—her or his credibility. The situation is made worse by the fact that a few key figures, who by virtue of their past behavior lends them particular authority in a field, lead the charge. Though I have no data for this, a not untypical response by a potential signatory might be "Well, if Professor X has signed this, it is likely to be true, so I'll take a chance and sign it too." This is an unfortunate situation to be put in, for all concerned.

One way around this would be to produce documents so bland that few scientists would risk anything, along the lines of "more research is called for in this area", or "the precautionary principle should be considered here…until more research is conducted." However, to be

effective, statements by scientists to policy makers should be as clear and practical as possible. This is the second bind: even scientists closest to the relevant data speak a sort of anti-language to that of policy makers. In the case of SARA legislation, this meant the language used by lawyers. Although it is obvious that the technical aspects of law simply lie outside the purview of science, the problem is that, in science, language is used to convey information as clearly and precisely as possible: scientists are taught to clearly demarcate between fact and conjecture, and are taken to task severely if they do not. Drafters of legislation are lawyers, and they are also taught to parse their sentences carefully, but it is not clear that there are negative consequences if they succeed in hiding intent. A judicious use of 'may' instead of 'shall' may be the difference between intending to do something and intending to do very little[6]. In science, if the intent were to obscure, this would be fraudulent. Though perhaps naïve, I think scientists are culturally incapable of dissecting legislation using the tools with which it was drafted. The draft legislation was, therefore, interpreted to key scientists by third-party lawyers, who then came to a conclusion and offered this to others who were asked to effectively vote by signing a document. If this caricature even partially reflects the situation, scientific credibility on SARA was being sold to the public using a sort of personal credibility that hinged on a few key members who could communicate intelligibly about both the science and the law.

It should be clear that the least desirable link in this chain is the confusing interplay between professional and personal credibility. I submit that it helps little, and risks much. But leaving this aside for the moment, what about the first connection? Obviously, we cannot ask all researchers to be adept at reading administrative law. But should we rely on lawyers from the Sierra Legal Defense fund to do this work for us? More critically (since I have utmost regard for Sierra Legal counsel), should we rely on these practitioners and those few credible scientists to meet up over coffee or at some hybrid conference such as this one to get the ball rolling? Here there may be room for disagreement. It is inevitable that the mixture of happenstance, serendipity, and personal contacts that plays a role in all human interactions should play a role in this one, and some would argue that this is a very effective way to get things done. One phone call to an old friend or neighbor might be all that it takes to clarify a sticky point. Indeed, some of this sort of thing probably took place in the case of SARA. However, in the area of public policy, the consequences are so important that this is certainly not transparent enough, and most probably not thorough enough.

Independent scientific input into law is not wholly haphazard. There are structures in place: after a Bill has been drafted and has gone to parliamentary committee, independent concerned scientists and organizations may submit briefs. However, these are avenues that react to proposed legislation rather than informing it. Unfettered scientific input to law should be made as early as possible[7]. It is noteworthy that Canada has no organization with the mandate and obligation to advise the federal government on scientific issues[8]. Indeed, Canada is the only G7 country not to have such an organization[8]. The National Research Council of the National Academies of the

United States of America and the Royal Society of London do have such a mandate[9], and they write high quality reports which make the news[10].

Canada does have its own Royal Society, whose full name is the Canadian Academy of the Sciences and the Humanities. Since 1995, it has instituted 'expert panels' on various issues and offered advice when solicited by government. It also fronts (since 1995) the 'Partnership Group for Science and Engineering', a cooperative association that, according to their web site, "helps parliamentarians, decision makers in government and industry…understand how research is performed, results interpreted and benefits derived." These two bodies are well placed to offer some of the input required in public policy, but they fall short. Importantly, neither has the mandate to present unsolicited input, nor do they have the resources to consider a broad range of issues. Finally, they are relatively obscure, which means they are less able to engage the public in discussion.

At least since early 2001, a working group has mooted a new organization that would overcome these three deficiencies. This organization, comprised of the Royal Society, the Canadian Academy of Engineering, and the new Canadian Academy of Health Sciences, would be mandated by government to provide "credible and independent assessments of the sciences that underlie pressing issues of the day."[11] The federal government has recently committed itself to establishing (and so, adequately funding) such a body, to be called the Canadian Academies of Science[12].

According to the proposal before the government, the new academy would assess rather than advise on science relevant to public policy. This means that it would supply information on what is known and what is not known about an issue, and it would examine the validity of the sciences informing the issue. The organization would include 'a diversity of stakeholders' to help formulate the questions requiring expert assessment. Importantly, the body would not explicitly offer recommendations for a course of action. Though cautious by virtue of being powerful, these go some way to address the need for independent input into public policy at a very early stage, even before legislation is drafted.

Somewhat confusingly, though, the organization would encompass not just what is traditionally considered the sciences but also the social sciences and the humanities, explicitly included as part of the 'full spectrum of sciences'[13]. While clear arguments have been made for the social sciences and the humanities engaging more directly in the public sphere[14], including them in a body that is supposed to assess the science behind issues of the day may cause confusion. Neither the National Research Council of the National Academy of Sciences of the United States of America nor the Royal Society of London identify science this broadly—indeed, it is hard to see how it can be so defined while remaining clear.

To return to the main theme of this submission, although there is no doubt that the coin of credibility applies as readily to the social sciences and the humanities as it does to the traditional sciences, and can also be traded with the public, is there a gold standard? What constitutes sound evidence worthy of consideration in the field of anthropology or sociology may not be so

considered by a biologist studying extinction risk. Because one critically important strength of the academy will be the stamp of credibility that it affixes to its submissions, its members must be vigilant so as not to confuse the public. The academy must maintain that *scientific* credibility I alluded to above if it is to be at all useful—in particular, its scientific conclusions must be based on scientific evidence, not rhetorical argument.

Of course, the academy could ask for a different mandate altogether, one that assessed science *and* offered recommendations based in part on their predicted effects on, for example, social institutions and economic well-being. Indeed, this might be the ultimate aim of the academy as it evolves[15]; however, the institution must remain clear on when these other considerations are included and how they are included. We cannot expect the media to accurately parse submissions from the academy for the public along these lines, just as we cannot expect scientists to parse the output of policy makers[16]. Critically, a compound mandate that includes the 'human sciences' risks diluting the science itself[17]. I call for more consideration of this particular issue.

Does the creation of an independent Academy of Science mean that lobbying instruments such as open letters can be done away with? I conclude with two considerations. The first is that many scientists do not want to engage in the public sphere. Producing a bureaucratic body like an academy might further absolve them of this responsibility: we can breathe easy now that the academy has taken the high road for us, and we need no longer worry that the best science has not filtered through to the bureaucrats in a timely, consistent, and forceful manner. But of course, the academy is not a lobby group, and the state can still choose to ignore even the strongest statements of probability. In great measure, scientists are trained to be poor lobbyists, and the academy will not help them become better ones. I can see no obvious way of changing science itself[18]: because we must be willing to die by the sword that is evidence, we must be cautious. We also should not ask scientists too often to dip into their credibility accounts. There are a few senior figures, though, who have vast reserves of credibility *and* who can speak with scientific authority on an issue. The media, nongovernment organizations, and other scientists must support those few and help them gain entry into those infamous corridors of power. I believe these senior scientists must then hold their noses and actively lobby for the rest of us, for the greater good. It is an imperfect world.

Endnotes

[1]See http://www.scientists-4-species.org for the original letter and some discussion of the changes called for that were made to SARA and those that were not made.
[2]For a brief overview, see O'Hear, A. 1989. An introduction to the philosophy of science. Oxford University Press, Oxford, U.K.
[3]The most famous recent case concerns a young physicist from Bell Labs, Jan Hendrik Schon, who fabricated data for 25 high profile papers. See Brumfiel, G. 2002. Misconduct finding at Bell Labs shakes physics community. Nature **419**:419–421.

[4]This case was notorious, involving several investigations at the federal level. In the end, all those accused were exonerated but not before Professor Baltimore resigned from his post as President of Rockefeller University. For the full story, see Kevles, D.J. 1998. The Baltimore case: a trial of politics, science and character. W.W. Norton, New York.

[5]For example, see the 'Statement on Authorship' for the journal Evolution: "Authorship of a paper carries with it responsibility as well as credit. All those whose names appear as authors … should be able to present and defend the work in a public forum. … All authors must be in agreement on both the submission and full content of any article carrying their name. Any violation of these conditions represents academic misconduct and will be dealt with accordingly."

[6]For example, the 2001 version of Bill C-5, Section 58, starts with the clear statement that "No person shall destroy...critical habitat." In the proceeding 'application', this loses its force, because it would only apply to that portion of critical habitat that the competent minister "may" specify. This would not qualify as good scientific writing. This particular ambiguity was purged in the final version that became law, though others remain.

[7]Indeed, Canada now has a science advisor to the Prime Minister. Dr. Arthur Carty's term began 1 April 2004: see http://pm.gc.ca/eng/chgs_to_gov.asp, update 24 January 2004. The United States has an analogous office; this is no guarantee of better policy. See Uses and abuses of science. The New York Times, 23 February 2004, which refers to an open letter by senior scientists.

[8]See Eggertson, L. 2001. Proposal for science gains support. University Affairs, October **01**:34.

[9]The U.K. Academy of Science (the Royal Society) was founded in 1660 by the government, and part of its express mission is "providing independent authoritative advice; promoting science education and awareness; disseminating science; facilitating organisational and individual links internationally; and representing the interests of science in the UK." See http://www.ost.gov.uk/research/councils/royal_soc.htm. In the United States, the National Research Council is part of the National Academies (Institute of Medicine and National Academies of Science, and of Engineering). Each of these is a nonprofit organization with a charter from the U.S. Congress to provide (health) science and technology advice. See http://www.nationalacademies.org/nrc/.

[10]See Pollack, A. 2004. No foolproof way is seen to contain altered genes. The New York Times, 21 January 2004. This considers a report by the NRC and commentaries on it.

[11]National Science Organization Working Group draft proposal, 2002. Unpublished.

[12]In the 6 October 2004 throne speech, the Martin government announced such a body, with a $35 million budget. See http://pm.gc.ca/eng/sft-ddt.asp

[13]It is not clear how the humanities ("philosophy, literature and art" according to American Heritage Dictionary [2000], and "the branches of polite or elegant learning; as language, rhetoric, poetry…" according to Webster's unabridged Dictionary [1998]) should be viewed as part of the full spectrum of sciences.

[14]Dr. Martha Piper, who served on the working group that drafted the proposal for the Canadian Academies of Science, has drawn attention to how research in the 'human sciences' (wherein she includes poetry, philosophy, and history) can and should directly consider civil society through focus on social problems. See Piper, M. 2002. Building a civil society: a new role for the human sciences. Killam Annual Lecture, Killam Trusts. Available from http://www.killamtrusts.ca. It is also evident that the social sciences (sociology, psychology, and anthropology) have much to offer science as it is applied explicitly to policy, but one must ask when this input should be made in the consultation process.

[15]Such a dual role is explicit in some of the Expert Panel Reports written for the government by the Royal Society; see Elements of precaution: recommendations for the regulation of food biotechnology in Canada. The Royal Society, Ottawa, Ontario. February 2001.

[16]Indeed, though they are not practitioners of 'human science', I strongly suggest that the Academy retain lawyers who can assist in this sort of translation.

[17]Here, there is a direct parallel with SARA legislation, which explicitly separates the scientific assessment of what is required for recovery of a listed species, found in the 'Recovery Strategy', and the socio-economic implications of any proposed actions, found in the subsequent 'Action Plan'.

[18]For instance, ecologists, in particular, are trained to falsify null hypotheses (they are Popperians), an attitude that may make them over-cautious when ascribing causality. A Bayesian perspective allows for relative probabilities to be based on both current data and past data, and might offer a framework for making clearer statements about current knowledge palatable to policy makers. However, it is doubtful that this would lead to qualitative changes in how scientists view third-party data and interpretation.