

The Dire State of Canadian Science Policy and a Leadership Role for Scientists and Engineers

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Science without democracy is arbitrary, democracy without science is ignorant.

— Dr. Ramin Jahanbegloo

The 21st century economies have relied heavily on scientific research and the development of innovative technologies. At the heart of such scientifically driven economies lies a connected network of stakeholders, including academia, industry, government and the general public. Science policy is the discipline at the boundary between the realms of scientific research and public administration. Its workings are twofold:

“policy for science” which involves developing strategies for enhancing the conduct of scientific research, and “science for policy” which offers avenues through which scientific knowledge informs government decision-making. During the past decade, the importance of this area has become increasingly more apparent in both academic and policymaking circles. Unfortunately, this important concept has received little coverage and is rarely the object of widespread open debate among the general population. In a recent editorial in the journal *Nature*, Canada is chided for “muddling along” when it comes to developing a robust science policy presence in government decision making (*Nature*, 2010). This article aims to provide an overview of the shortcomings within the Canadian science policy landscape, with an emphasis on the relevance of the leadership role of scientists and engineers.

Who speaks for science in Canada?

Dr. Arthur Carty was appointed by Prime Minister Paul Martin to the role of National Science Advisor at the Privy Council Office, which is tasked with providing essential advice and support to the Prime Minister and Cabinet. His efforts helped with the revitalization of the Council of Canadian Academies, an umbrella organization of the Royal Society of Canada, the Canadian Academy of Engineering and the Canadian Academy of Health Sciences (Government of Canada, 2006). Upon the arrival of the Conservative government, Dr. Carty’s office was moved from the Privy Council Office to a new home within Industry Canada and four years later, the office of the National Science Advisor was altogether eliminated in 2008 (Government of Canada, 2006; Privy Council Office, 2010). In the eyes of the Canadian scientific community, the news of this elimination further darkened an already murky image of the supposedly open line of communication with the government. Enter the Honourable Gary Goodyear, who in

2008 was appointed by Prime Minister Stephen Harper to the junior cabinet position of Minister of State for Science and Technology within Industry Canada. Scepticism over the future of science policy in the Canadian government heightened in the aftermath of Dr. Goodyear's blunt refusal to answer a question on whether or not he believed in evolution, citing religious reasons. Following an outcry from academic circles, he attempted to backtrack with a vague Lamarckian explanation: "We are evolving every year, every decade. That's a fact, whether it is to the intensity of the sun, whether it is to, as a chiropractor, walking on cement versus anything else, whether it is running shoes or high heels, of course we are evolving to our environment" (Off and Brown, 2009). That did not help matters, nor did the significant cuts to research funding in the 2008 and 2009 federal budgets.

In 2008 about a dozen post-docs and graduate researchers, including myself, came together under the leadership of Dr. Mehrdad Hariri, to organize the very first annual Canadian Science Policy Conference (CSPC) in October of 2009 (<http://sciencepolicy.ca>). This national grass-roots conference was aimed at taking the first step toward creating a science policy forum by bringing together attendees amongst all concerned stakeholders, including government, academia, industry, media and the general public. We recognized that in order to achieve any progress, the conference format must be neutral, inclusive and non-partisan. Through this approach, we were grateful to be able to bring government officials, academic scientists, industry and media representatives to the same table. These included the Hon. Gary Goodyear, Preston Manning, Dr. Bruce Alberts, and the Hon. John Milloy, and leaders from various Canadian universities, research funding bodies and the industry. The discussions between the 60 speakers and over 400 attendees spanned many issues, and the generated ideas varied amongst the different stakeholders, but the bottom-line message was loud and clear: the

landscape of Canadian science policy is in need of significant renovation.

While the recent 2010 federal budget has garnered broad support from various academic bodies, problems still remain with the way science policy is shaped in this country. The major issue with the current state of Canadian science policy is the limited external independent input from academic scientists into policy decisions. Canada has nothing comparable to the White House Office of Science and Technology Policy, which is headed by a science adviser who reports directly to the US president (Nature, 2010). While the Canadian government receives external science advice from two impressive and knowledgeable bodies of experts, the Science, Technology and Innovation Council (STIC), and the Council of Canadian Academies, most of the examined issues are referred to these bodies for analysis by the government. Despite the presence of organizations like STIC, Canada has no analogue to the United States' American Association for the Advancement of Science, dedicated to focusing attention on science policy. There is a need for an open forum that allows academic scientists to provide high quality analysis on science-based issues of relevant and emerging challenges they consider urgent. Currently no such official channels exist for the broad scientific community to proactively provide non-mandated expert opinion to all policymakers at the federal level, on long-standing policy shortcomings, and rapidly emerging issues. The issues with the current state of science policy in Canada are not limited to the lack of adequate scientific input within the government.

Is the public 'science-illiterate'?

In theory, given the role of science in improving quality of life, the interests of scientists, politicians and the public should be easily aligned. In practice however, the message

is just as easily lost. The general public is regularly and unfairly blamed for lacking the capacity to understand scientific issues. The media are also criticized for failing to adequately inform the public. According to one CSPC 2009 panelist, the media was responsible for producing the gravest source of distortion of scientific research, prompting Mike Spear, director of Corporate Communications at Genome Canada and a former journalist, to retort, “The media’s job has always been to tell a story compactly; if you want to tell a full story, write a book.” Mr. Spear also argued that scientists have to engage in the discussion and not assume that the science-illiterate public is the sole missing link. Dr. Robert Mann, a physicist from the University of Waterloo, went further and disagreed with the entire notion of the ‘science-illiterate’ public, criticized the practice of talking down to the general population and pointed out the shortcomings of the scientific community to actively engage society. Preston Manning, a keynote speaker at CSPC 2009, discussed bridging the communications gap between the scientific and political community. He asserted that the scientific community has not yet grasped the extent to which communication utterly dominates the political and public policy arena. If a contemporary politician, he argued, cannot see how it would be possible to communicate a proposed position within 90 seconds, then that position is in trouble, no matter its scientific or societal merits. Such discussions highlighted a failure in our community to proactively steer the conversation toward a more scientifically informed discussion between the various stakeholders.

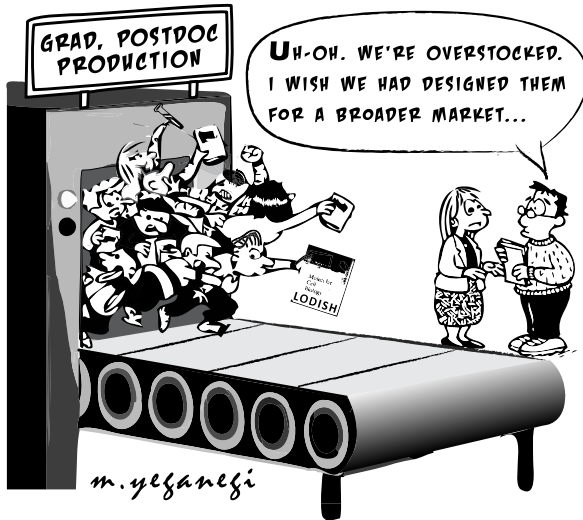
In response to this call, a recent development has been born out of the CSPC 2009 conference, and calls for the creation of SciencePAGES, which is similar to POSTnotes, an existing initiative by the UK parliament. The SciencePAGES initiative involves graduate students, post-docs, researchers, and communication experts coming together in small teams to publish succinct peer-reviewed summary notes that easily

explain scientific issues relevant to policy discussions of the day. Such an initiative can help guide politicians, and in some cases the public, in understanding scientific issues and their relevance to society. A public forum may also accompany such publications and help fuel the debate in an informed manner.

Role of scientists in society: Are we producing too many researchers?

Depending on how one perceives the above question, the answer is yes and no. In a report entitled "A postdoctoral crisis in Canada: From the 'Ivory Tower' to the Academic 'Parking Lot'", the Canadian Association of Postdoctoral Scholars has noted that the average postdoctoral salary ranges in the \$35,000-\$45,000 bracket (Parker, 2002; Stanford et al., 2008). According to Statistics Canada, there was a relative decline in the proportion of PhDs who were university professors from 34% in 1986 to 24% in 2001, coupled with a 93% growth in the total number of PhDs over the same period (McKenzie, 2008). In 2007, Canadian universities hired 2616 new full time university professors, and awarded 4,800 PhD degrees, with 6000 existing post-docs (Canadian Association of University Teachers, 2010). While not all those pursuing a PhD degree necessarily seek an academic career, it seems clear that with the ever-increasing length of post-doc positions, the swelling number of post-docs, heightened competition, and the lack of resources to accommodate this growing pool of expertise, the majority of post-doctoral fellows will not be able to secure a faculty position.

A number of solutions have been presented. The instinctive response has been to call for an increase in the number of available faculty positions. However, if the goal is to strike a balance between the needs of scientists and the interests of society as a whole, simply increasing academic positions for the sake of accommodating post-docs, while rea-



sonable, is hardly the most ideal. Are we producing too many trainees then? Not exactly. Decreasing the number of trainees is misguided. Competition alongside collaboration is recognized as key to driving innovation and research. On the other hand, we are in fact producing many trainees who are almost exclusively prepared for the academic path. There is also an inherent bias within graduate programs that expects graduate students to go on to follow academic research careers. We must move beyond the perception that, to abandon the academic career path somehow translates to conceding in the face of a challenge. The notion that we are producing too many trainees assumes that following the traditional academic option is the only 'successful' outcome of a research-based education. Training at the graduate level should then be updated to realistically reflect a range of career alternatives for trainees, since an exclusive focus on research skills is no longer sufficient. Exposure to non-academic career paths, coupled with project management and leadership training can help prepare the 76% of PhDs who cannot pursue the tradi-

tional academic route.

The next generation of scientists: A new culture of civic engagement

One resonating theme throughout the discussions at CSPC 2009, that is certainly relevant to engineering leadership, involved a call for more scientists to become involved in public policy. Of course, this would require Canadian institutions to prepare and train their graduates to lead beyond the singular academic path. During the course of my discussions at CSPC 2009, I spoke with several young researchers who had recently begun such a transition into the policy arena following many years in the academic field. I met a physics post-doc who had completed an internship at the Manning Centre for Building Democracy in preparation for a career in policy-making. Regrettably, only a few Canadian university programs are devoted to science policy as compared to over a dozen just south of the border (American Association for the Advancement of Science, 2009; Haak, 2003). There are some hopeful developments however. Creative initiatives include a call for scientists to serve on government committees, an idea that has been raised with increasing frequency. Citizen Engineer, a student group at the University of Toronto, tasked with “enabling students to help others towards effective public policy”, recently presented a lecture on the topic “Engineers in Parliament”. The Professional Engineers of Ontario (PEO) has also set a goal of ‘11 by 11’—that is 11 engineers in the 2011 legislature. At the federal level, there are currently only eight MPs who are engineers.

Opportunities for scientists to take on leadership roles are by no means limited to policy-making. In a CSPC 2009 panel on this topic, panelists and attendees differed on the respective responsibilities of scientists, the public and the media in nurturing civic engagement, resulting in an interesting and at

times, heated debate. However, a consensus began to form amongst the attendees that as a community, scientists needed to become more socially aware. Specific programs that help to produce socially-aware scientists could help. Excellent opportunities for leadership development exist at the University of Toronto in the Faculty of Applied Science and Engineering; both the Leaders of Tomorrow (LoT) program, and the Centre for Global Engineering (CGEN), can certainly drive students to further develop their leadership skills. Yet these initiatives must also be accompanied by a conscious cultural shift within university departments to place due emphasis on the importance of the social aspects of scientific research within the undergraduate and graduate curricula. Innovative courses such as “Knowledge Mobilisation to Serve Society” offered by University of Waterloo and “Technology, Engineering and Global Development” offered here at the University of Toronto are of great importance. The formation of a Task Force on Engineering Leadership Education at the University of Toronto, endorsed by Dean Cristina Amon, is most encouraging. For their part, young researchers and engineers should also take initiative by becoming more involved in the leadership opportunities that are so readily accessible to them.

Conclusion

Among the many shortcomings that exist in the Canadian science policy arena, scientists most commonly cite the media’s inability to properly communicate the significance of scientific ideas, the politicians’ sometimes ignorant and often politically short-sighted decision making process, and the public’s inability or unwillingness to grasp scientific issues. While one cannot dispute some truth and validity to such criticisms, we should also identify shortcomings within our scientific community. Every scientist should be able to cite the cost and explain their work to the public in 90 seconds, but few are

able to do so. Canadian scientists should educate themselves with more effective ways of communicating the importance of research, expand their understanding of the links between science and policy, and aim for a broadened social perspective.

It was all perhaps best summed up in less than 140 characters by an attendee via Twitter during a CSPC 2009 panel: "Enough about science-illiterate public. What to do about public-illiterate scientists?" That's the ultimate question. [ELR



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