

CAUT Response to Industry Canada's 2014 S&T Strategy

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At the beginning of December 2014, Prime Minister Stephen Harper and Minister of State (Science and Technology) Ed Holder released their science, technology and innovation strategy and launched the Canada First Excellence Research Fund (CFERF). This brief looks at the implications of the proposed policy on academic research and on research and development performed in Canada, and proposes a new direction in science policy.



On December 4th 2014, Prime Minister Stephen Harper and Minister of State (Science and Technology) Ed Holder released their science, technology and innovation strategy and launched, at the same time, the Canada First Excellence Research Fund (CFERF). The strategy, *Moving Forward in Science, Technology and Innovation 2014*, essentially echoes the 2007 strategy, *Mobilizing Science and Technology to Canada's Advantage*. The “new strategy” continues with the overriding focus of the federal government's approach to science to support businesses in the commercialization of ideas and knowledge, while undervaluing basic, discovery-driven research.

A “New” Sciences and Technology Strategy or a Political Strategy?

There is nothing particularly new in the 2014 strategy compared with the document released seven years earlier. In 2007, the priority was to find ways to leverage science and research in order to develop products, services and technologies that “create a productive, sustainable and competitive society.” To do so, the 2007 strategy proposed to realign what was identified as the two key pillars in science and technology — the “people pillar” and the “knowledge pillar” — and put them at the service of businesses to promote Canada's “entrepreneurial advantage.”

Seven years later, the “new strategy” is essentially based on the same vision. The same two original pillars remain, but reference to “entrepreneurial advantage” has been replaced by a third pillar called “innovation.” This “new pillar” is narrowly defined and reinforces the view that the federal government's role is to support short-term economic and business needs. In fact, it may be said that the only “innovation” in the 2014 “new” strategy is making “innovation” a pillar of S&T, without recognizing basic research as one of the main components of innovation.

One of the key elements of the 2007 strategy was the decision by the federal government to target four industries that would benefit from their strategy: environmental science and technology; natural resources and energy; health sciences and technology and related life sciences; and, information and communication

technology. The 2014 strategy covers the same areas and adds advanced manufacturing. The manufacturing sector has historically played a strategic role in the Canadian economy, notably by adding value to natural resources. However, the manufacturing sector has been in crisis for at least the past decade, having been heavily affected until recently by the rise in value of the Canadian dollar as a result of, among other things, the increase in the prices of oil and other natural resources. The recent decline in oil and commodity prices has seen the dollar fall sharply in value, but given the long-term damage to the manufacturing sector it is not clear whether this is enough to stimulate a recovery.

Manufacturing is particularly important in southern Ontario, a region that makes up nearly half (45%) of all the manufacturing jobs in Canada. While exploring ways to revive Canada's flagging manufacturing sector is long overdue, it begs the question of why the Conservative government largely ignored the crisis for so long. The timing of the announcement of a “new strategy” in an election year is significant. This is particularly so given the large number of seats at play in Southern Ontario.

Cutting Basic Research to Fund Businesses

By making it mandatory to evaluate projects based on potential commercial outcomes, the science and technology strategy will continue to shift resources from discovery-driven research to businesses research and development (R&D). Discovery-driven or basic research refers to experimental and theoretical work undertaken with the primary aim of acquiring new knowledge, and not necessarily with any particular application or use in view. The objective of basic research is to gain more understanding of the subject under study. Although basic research may not have specific applications as its goal, the most important scientific discoveries have typically come from basic research driven by a quest for knowledge.

The federal government's support for the conduct of basic research in Canada has stalled in recent years. The budgets of Canada's three granting councils — the Canadian Institutes for Health Research (CIHR), the

Natural Sciences and Engineering Research Council (NSERC), and the Social Sciences and Humanities Research Council (SSHRC) — have seen only modest growth in their base budgets. As a result, when adjusted for inflation, basic research funding is well below levels recorded in 2007 when the government adopted its *Mobilizing Science and Technology to Canada's Advantage* strategy. Overall, base funding for SSHRC is down over 10.5 percent in real terms, support for NSERC has dropped 4.4 percent, and CIHR funding has declined by 7.5 percent (Table 1).

One impact of this declining support in real terms for basic research has been a marked decline in the number of promising research projects that can be funded. The success rate for NSERC's Discovery Grants has fallen from 71 percent in 2008 to 64 percent in 2013. The success rate for SSHRC's standard research grant, now called the Insight Grant, has dropped from 40 percent in 2006 to just 21 percent in 2013. For CIHR, the percentage of successful applicants is 18 percent in 2013, down from 31 percent in 2009.

While providing inadequate support for basic research, the government has also targeted new investments toward directed research that it alleges will foster commercial innovations. NSERC's shift in funding from basic research towards "fettered" industrial partnerships provides the clearest expression of this trend. In 2008-09, about 60 percent of NSERC's research project funding was dedicated to basic or "unfettered" research. In the current fiscal year, "fettered" research receives about the same level of funding as discovery grants, after an

increase of 30 percent since 2008-09 when adjusted for inflation. This is compared to a drop of 8 percent in the value of discovery grants during the same period. (Graph 1)

Meanwhile, to better control the implementation of their strategy, the federal government has also changed the composition of the boards of the granting councils, appointing industry and political figures at the expense of scientific experts. Public agencies such as the National Research Council are seeing their mandate narrowed and explicitly tied to industrial interests.

Canada's university-based researchers remain deeply troubled by the increasing tendency of the government to target research funding and bypass the peer review process. Rather than allow the scientific community to determine what research is most worth funding, the government has increasingly required the granting agencies to direct funding toward industrial collaborations, specific disciplines or topics determined by the government. The government has also used recent budgets to direct funding to specific research facilities. In the last few federal budgets alone, all new money for research has been directed at industry-university partnerships or targeted industries.

The focus on business innovation and the commercialization of research, with the emphasis on requiring government scientists and university-based researchers to collaborate with industrial partners, can undermine the integrity of scientific research. In a report published by CAUT in 2013 examining 12 major

Table 1 Federal Government Funding to Tri-Councils (constant 2010 dollars)

	2007-8	2008-9	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2007-15
SSHRC	383.7	358.1	368.1	359.4	355.6	351.5	348.9	343.5	-10.5%
NSERC	1057.9	1051.5	1042.3	1050.2	1030.8	1018.9	1015.2	1011.4	-4.4%
CIHR	1017.8	989.8	1020.1	1026.9	953	969.4	947.7	941.6	-7.5%
Indirect costs	327.9	335.7	330.9	324.9	322.6	318.9	315.0	320.4	-2.3%
Total	2787.2	2735	2761.5	2761.4	2662.1	2658.7	2626.8	2616.8	-6.1%

Source: SSHRC, NSERC and CIHR Departmental Performance Reports, Budget 2014

collaboration agreements involving universities, industry and governments in Canada, it was found that seven agreements provide no specific protection for academic freedom, and only one requires the disclosure of conflicts of interest. Only five of the agreements give academic researchers the unrestricted right to publish their research findings and just half provide that the university maintains control over academic matters affecting staff and students.

This approach reflects a dangerously shortsighted and narrow view of science that ignores the history of scientific advances. The discovery of X-rays, nylon, Teflon, GPS technology, informatics, superconductivity and medical imaging are just some of the innovations that emerged as the unanticipated results of basic research. The evidence clearly suggests that a narrowing focus on commercialization can stifle the creativity and unexpected discovery fundamental to basic research. A narrow focus on applied commercial research can also distort the focus of scientific investigation in ways that run counter to the public interest. In the area of medical research, for instance, the obsession with commercial outcomes has encouraged an emphasis on minor modifications to existing drugs and devices, rather than

fundamental explorations of the causes of illness and methods of prevention.

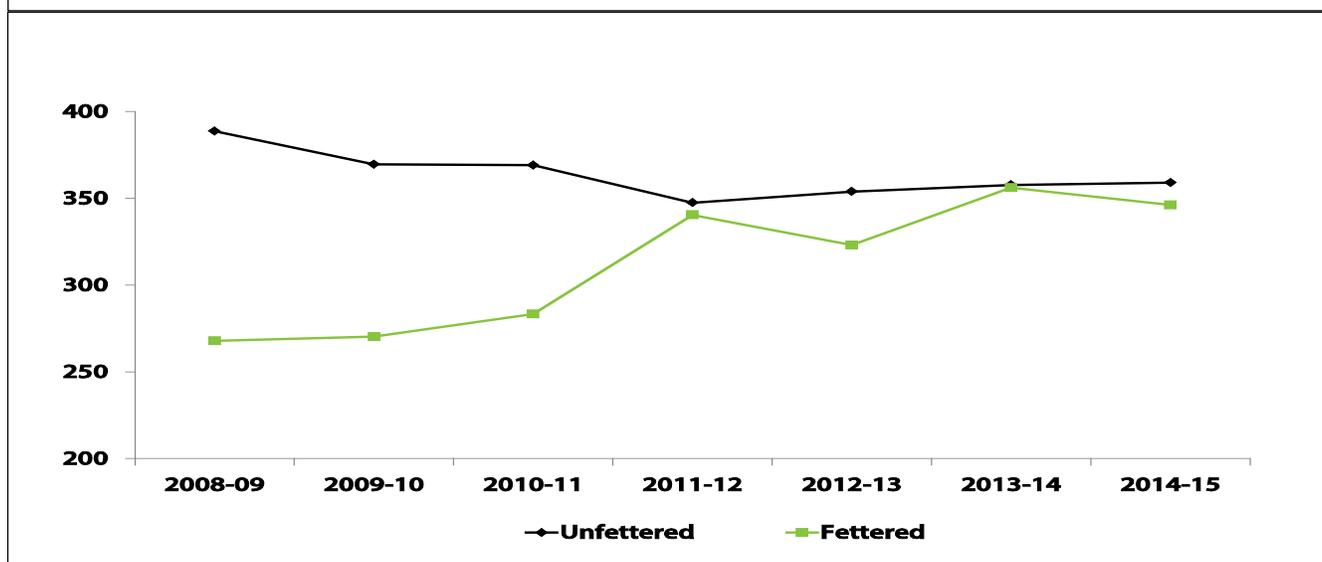
As John Polanyi, Canada's most prominent Nobel laureate has warned, when governments or industry try to direct scientific inquiry, rather than allowing the scientific community to do so through its rigorous peer-review system that protects the integrity of their work, our scientific horizons shrink and our future is diminished.

Shifting Basic Research to Businesses Does Not Lead to More Investments in R&D

One of the cornerstones of the government's S&T strategy since 2007 is the requirement that universities and colleges collaborate with industry on scientific research. The assumption is that these partnerships will increase business investment in R&D and promote commercial innovation.

After seven years, it must be recognized that this approach has failed. According to the latest data from Statistics Canada, business investment in R&D has

Graph 1 Discovery Grant Versus Targeted Research Funding (constant 2010 dollars, in millions)



Source: NSERC Departmental Performance reports, NSERC Report on Plans and Priorities 2014-15

decreased drastically, from \$17 to \$14 billion spent between 2006 and 2013 after inflation. That represents a drop of 17.7 percent (Graph 2).

The data presented in the new strategy confirms Canada's failure and the decline in its investments with respect to R&D: "We see that while businesses in OECD countries spend an average of 1.63 percent of GDP on R&D, in Canada, the figure was only 1.11 percent in 2006 (\$16.5 billion) and this fell to 0.88 percent (\$16.2 billion) by 2012. Out of 34 OECD countries, this drop takes us from 16th to 22nd place," (2014 S&T Strategy, page 8).

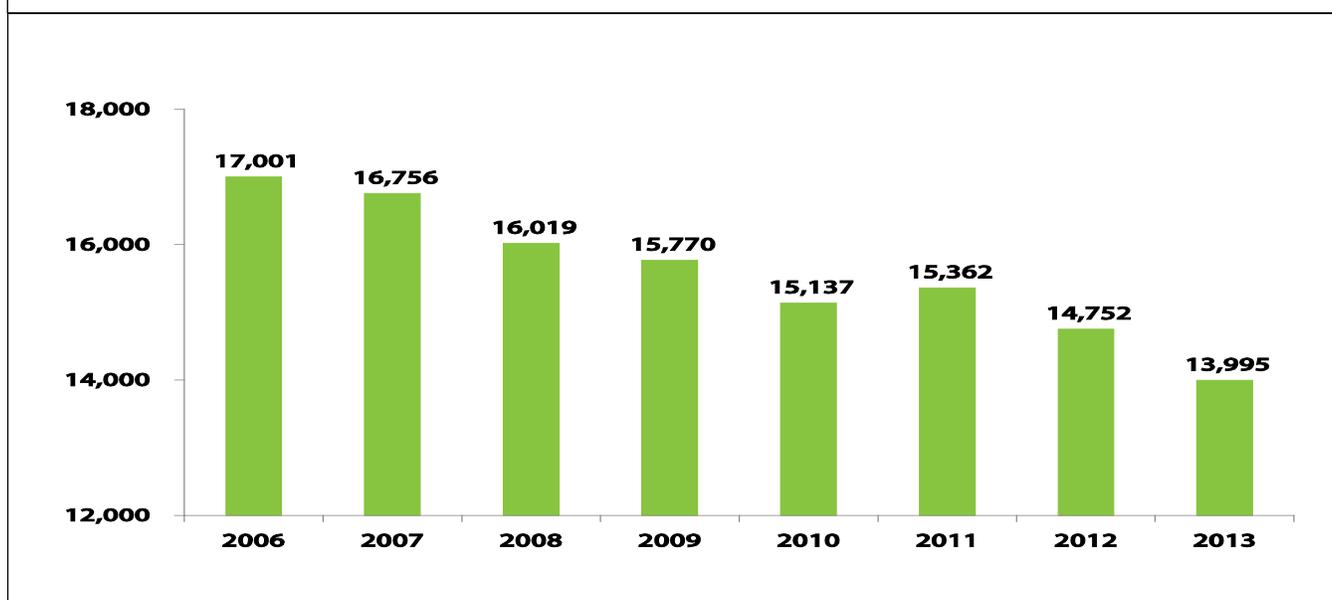
Furthermore, while business investment in research was down, so was the overall R&D performed by the federal government. Since 2007, the total amount spent in R&D by the federal government sector in Natural Sciences and Engineering, Social Sciences and Humanities, went from 2.6 billion to 2.2 billion in real terms between 2006 and 2013. This is a decrease of 13 percent over that period (Graph 3).

The most recent data show that this trend is continuing. The 6.9 percent cuts in federal government R&D funding over the latest year directly contributed to the 0.6 percent decrease in research and development carried out in Canada in 2014 (Table 2).

Canada First Research Excellence Fund (CFREF): New Bottles, Old Wine

As part of its "new" science, technology and innovation strategy, Prime Minister Harper also unveiled the Canada First Research Excellence Fund (CFREF) on December 4th, 2014. This is essentially a special and non-recurrent investment of \$1.5 billion over 10 years, or an average \$150 million per year. According to the announcement, the Fund will be available to all post-secondary institutions. Successful projects will be required to align with the priority research areas indicated in the new S&T strategy. Grants will be awarded on the basis of strategic relevance to Canada which, according to the government, includes the potential for the research area to create long-term

Graph 2 Amount Spent by Businesses in R&D in Natural Sciences and Engineering, Social Sciences and Humanities, 2006-2013 (in million of 2007 constant \$)



Source: Statistics Canada, Cansim Table #358-0001, extracted in December 2014

Table 2 Estimated R&D Performed by Sectors, 2013-2014

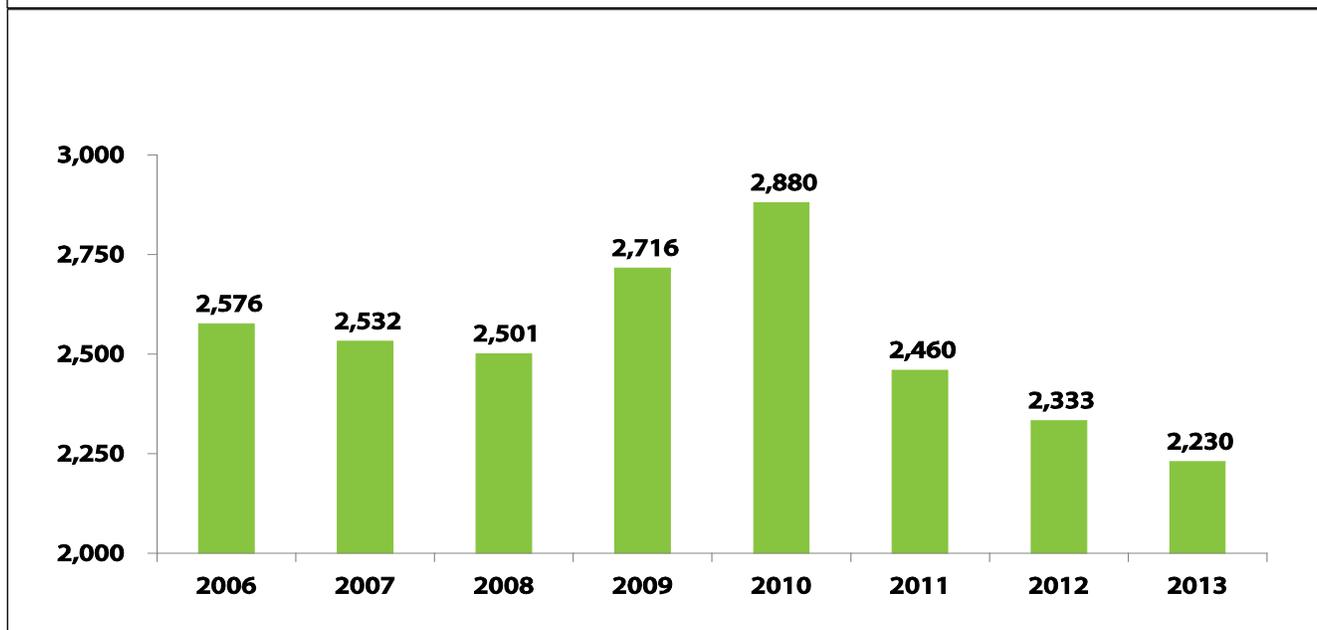
	2013 (in millions of \$)	2014	13-14 % change
R&D performed by all sectors	30,748	30,572	-0.6%
R&D performed by federal government sector	2,475	2,305	-6.9%
R&D performed by provincial governments sector	305	304	-0.3%
R&D performed by provincial research organizations sector	34	34	0.0%
R&D performed by business enterprise sector	15,535	15,401	-0.9%
R&D performed by higher education sector	12,237	12,360	1.0%
R&D performed by private non-profit sector	161	169	5.0%

Source: Statistics Canada, Cansim Table #358-0001, extracted in December 2014

economic advantages for Canada, and of the quality of the implementation plan.

The Fund will be administered by the Social Sciences and Humanities Research Council of Canada (SSHRC) on behalf of the three granting agencies. Grant applications

will be reviewed by independent panels of scientific experts as well as an arms-length selection board composed of leaders from the academic, public and private sectors. Final decisions, however, will be made by a committee including two Deputy Ministers and one representative of each of the granting agencies.

Graph 3 Total Amount Spent in R&D by the Federal Government Sector in Natural Sciences and Engineering, Social Sciences and Humanities, 2006-2013 (in million of 2007 constant)

Source: Statistics Canada, Cansim Table #358-0001, extracted in December 2014

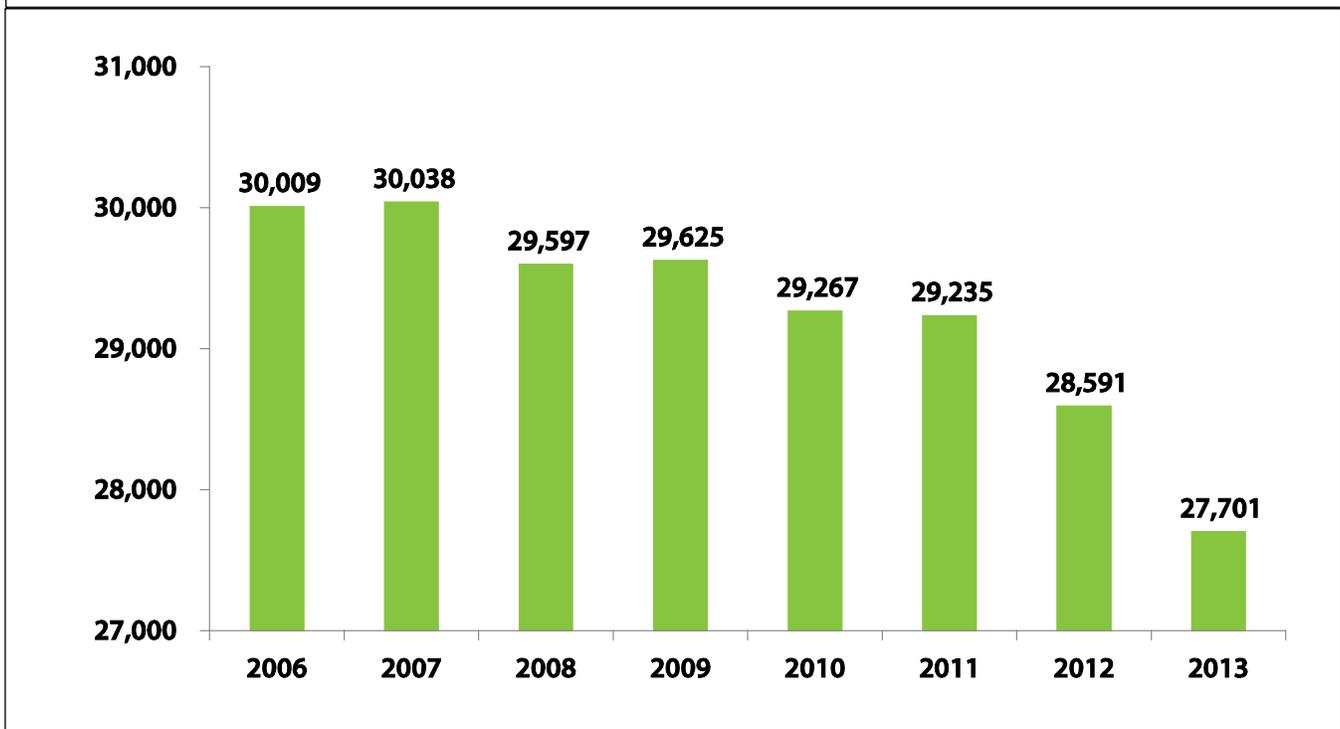
There are several aspects of the program that are of concern and warrant a closer look. Firstly, the Fund's requirement that investments will be made only in predetermined sectors will exclude many research fields that fall outside the government's priorities. Secondly, for a project to be accepted, it must be demonstrated that it will have "long-term economic advantages for Canada." These advantages will be evaluated by an external board composed of private sector interests. Basic research will once again be marginalized. Thirdly, the final stage of the granting process is of great concern. The final decision will be made not by the scientific community but by senior government officials chosen by the government of the day, including two Deputy Ministers. This involves a risk of political interference in research directly reducing the authority of the peers in awarding grants based on scientific merit.

Lastly, the amount of funding provided by the program is inadequate to make up for recent cuts. The new funding will not fill the gap left by disinvestment in R&D in recent years. Total investments in R&D in Canada were \$27.7 billion in 2013 while they were \$30 billion in 2006. This represents a real decrease of 7.7 percent since the Conservatives came to power (Graph 4). We would need to spend at least \$2.5 billion of new R&D money in 2015 alone merely to match 2006 R&D spending in Canada, inflation considered.

Canadians Need a New Direction in Science Policy

Canadians need a new science policy that puts the public interest first and builds upon the proven strengths of government and higher education-based research. As a first step, this requires a commitment by the federal

Graph 4 Total Amount Spent in R&D in Natural Sciences and Engineering, Social Sciences and Humanities, 2006-2013 (in million of 2007 constant)



Source: Statistics Canada, Cansim Table #358-0001, extracted in December 2014

government to substantially increase the base funding of the three granting councils.

The problem facing public scientists and researchers today is not simply one of reduced funding. It is also about a change in how and what governments are funding. As demonstrated above, the federal government has increasingly earmarked and targeted funding, either through the federal granting councils or by directing grants at specific institutes and projects. The government has targeted a growing share of funding at projects that have commercial applications. This has often been done with limited consultation with the scientific community. However, a narrowing focus on commercialization can remove the creativity and unexpected discovery fundamental to basic research, and distort the focus of scientific investigation. In the area of medical research, for instance, the obsession with commercial outcomes has encouraged an emphasis on minor modifications to existing drugs and devices, rather than fundamental explorations of illness and prevention. The commercialization of research can also undermine the integrity of public research. Industrial partners, interested in preserving their commercial interests, have attempted to suppress or delay the publication of research results and to steer research away from inquiry that promises public benefit but little commercial profit. The history of scientific progress has shown that the economic and social benefits of research can only be fully realized if governments recognize that good research does not emerge from political diktats or narrow industrial demands. The value of scientific studies and projects is best assessed by impartial experts through peer review, not by politicians or special interests. The federal government has placed unacceptable political controls on public science. It has muzzled scientists and politicized the research carried out by its departments and public agencies. To serve the public interest, government scientists must be free to speak publicly about their findings. A new science policy must be based on the principle that research funding decisions should be free from political or industry influence. This means the three federal granting councils must be made more arms-length from government and their governance bodies must be composed primarily of scientists.

Canadians and their elected representatives also need unbiased and non-partisan advice on science policy. The Office of the National Science Advisor had been designed to fill this role, until it was eliminated by the Conservative government. One potential new approach would be to create a Parliamentary Science Officer (PSO), an independent officer of the Library of Parliament who would report to the Senate and the House of Commons. The PSO would provide independent advice and analysis to Parliament about the adequacy and effectiveness of the nation's scientific policies, priorities, and funding.

Finally, Canada's government has also changed legislation and severely cut scientific staff and programs at a time when sound science-based decision-making is needed more than ever. Canadians face major challenges including those related to climate change, energy demand, public health, and drug safety. Government departments and agencies, such as Natural Resources Canada, Environment Canada, Fisheries and Oceans Canada, Health Canada, Agriculture and Agri-Food Canada, Statistics Canada and the National Research Council (NRC) have a vital role to play in confronting these challenges, but can only do so when they are adequately funded and free to pursue their work. The federal government must re-invest in its own research programs and free its scientists to provide the public with reliable and independent scientific knowledge and advice.