



**THE CANADIAN CONSORTIUM FOR RESEARCH
LE CONSORTIUM CANADIEN POUR LA RECHERCHE**

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ISSUES AFFECTING RESEARCH AND RESEARCHERS IN CANADA

Submission to Canada's Fundamental Science Review – September 2016

The Canadian Consortium for Research (CCR) was established in 1976. It consists of 20 organizations that represent researchers in all disciplines across Canada. While the majority of these researchers are based in universities, the constituent organizations have numerous members in government laboratories and in private sector research centres. With more than 50,000 researchers and 500,000 students represented in these member groups, the CCR is the largest umbrella organization in Canada whose primary concerns are the funding of research in all sectors and support for post-secondary education. All activities of the Consortium are conducted with volunteers from the constituent member societies and organizations; see Appendix A for a listing of the CCR's current members.

SUMMARY

The CCR is pleased to provide its input into Canada's Fundamental Science Review being overseen by Minister Kirsty Duncan, Minister of Science. Canada's capacity to build knowledge, innovate, compete internationally, and in turn, thrive economically, socially, and culturally, is dependent on numerous factors that include but are not limited to:

- Canada's investment in fundamental research through the granting councils;
- the ways in which research is funded, reviewed, and awarded;
- availability of support for students and early-career scientists; and
- availability of stable funding to support knowledge infrastructure and a broad spectrum of research carried out in various environments.

Many members of the CCR will be making separate submissions on behalf of their respective associations that will speak to many of the issues included in this submission, as well as to issues specific to the research conducted by the members of their given associations. The CCR's recommendations reflect the following three broad categories that cross-cut the views of all of the CCR's members:

1. Increase Funding for Fundamental Research and Researchers
2. Ensure Long-term and Stable Funding for Knowledge Infrastructure
3. Support a National Science Policy Agenda and a Science Culture in Canada

RECOMMENDATION 1: INCREASE FUNDING FOR FUNDAMENTAL RESEARCH AND RESEARCHERS

Continued, increased, and balanced funding for research via the granting councils, as well as stabilized funding for operating and infrastructure support, are critical to developing a science culture in Canada that will embrace discovery, engage in evidence-based decision making, encourage the education and training of a highly-skilled workforce, promote the development of an innovative knowledge-based economy and society, and secure Canada's place as an international science destination.

Funding and Peer Review Improvements

Canada's three funding agencies (NSERC, SSHRC, and CIHR) support research programs rather than research projects. This distinction is an important one as it allows Canadian researchers the opportunity to conduct broad discovery-based research programs that provide the knowledge that fuels Canadian innovation, prosperity, and inclusion. More to the point, members of the international scientific community, including Canadian researchers working abroad, consider Canada's dedication to research programs as unique and innovative and identify it as a reason they would consider moving to a Canadian research institution.

The current government is to be commended for its Budget 2016/17 investment in fundamental research to the granting councils, and particularly to SSHRC. Should the government continue with yearly 3% funding increases for the next three years, by 2020 the granting councils' funding should be restored to the 2007 levels at a minimum – of note, there would still be an imbalance in the funds to SSHRC. Budget 2016/17 began to address SSHRC's funding gap relative to the other granting councils, and this process should continue for the next three years. Overall, to keep pace with competitor countries, larger investments in fundamental research are needed.

Canada's granting councils are widely admired internationally and form the bedrock of support for research in Canada; however, of late, researchers have seen instability, and thereby negative impacts, in terms of how research is funded, reviewed and awarded. Recent years have seen:

1. *Significant variation in the distribution of funds the granting councils received* – SSHRC has seen the largest reduction in funds since 2007 but gets the least amount of funding increases, despite the fact that social scientists and humanists represent over half of Canada's researchers. Social sciences and humanities research provides essential information on social, cultural, psychological, economic, technological and health-related issues and is thus necessary to answer key societal questions that could in turn inform public policy.
2. *A steady fall in the success rates for the granting councils* – Decreased funding levels and, in some cases, flawed and/or limited review systems have resulted in many researchers rated highly by standards of excellence being turned down each year for lack of funding. For example:
 - In 2015-16, about 25% of Canadian researchers in the humanities and social sciences received funding from SSHRC (or about 14% counting only primary investigators), a rate of coverage that has been stable for the past 10 years.

- Insufficient funding for health-related research as evidenced by a 13% success rate for CIHR's 2016 Foundation and Project Grants competition.
 - Over the past decade, NSERC has managed the funding deficiency by reducing or holding the value of the research grants flat in nominal dollars. The ability of NSERC-funded researchers to conduct research and, most importantly, to support graduate students, has been seriously affected, particularly when effects of inflation are factored in.
3. *Insufficient funding for health-related research that is truly reflective of CIHR's four pillars of research and/or cross-cuts its own institutes* – As the major federal funding agency supporting health research in Canada, the work of CIHR's 13 institutes should reflect four pillars of research (biomedical; clinical; research respecting health systems and services; and the social, cultural and environmental factors that affect the health of populations); while it does so, the majority of funding tends to be allocated towards research that is biomedical and clinical in nature.
 4. *Funding investments that have been targeted or directed towards specific programs of research* – SSHRC is overseeing the Canada First Research Excellence Fund with \$1.5 billion dollars invested by the previous government; these grants are meant to fund projects, put forth by universities, that don't meet the criteria of an individual granting council. While targeted research can address specific issues, there is a place for fundamental research, characterized by short and long timelines that defines, validates, challenges, and resolves important questions; leads to significant advances; and attracts and develops world-leading research teams whose activities will produce top scientists, professionals, students, and post-docs.
 5. *Insufficient funding for research projects that cross-cut two or more of the three council funding agencies* or that show evidence of collaboration between funding agencies (e.g. impact of workplace culture and organizational procedures on mental health; projects that are interdisciplinary but have an infrastructure/technical component). Opportunities for funding that are more cross-, multi- or inter-disciplinary in nature are required.
 6. *Funding deadlines and requirements that differ substantially*, leaving researchers with no alternate application choice if they submit to one agency and are subsequently informed that their application doesn't meet the eligibility criteria of that agency.
 7. *Heavy administrative and reporting burdens on researcher applicants.*
 8. *Lack of transparency amongst some of the agencies with respect to their processes* – any government funding that is given to an agency, whether to researchers or students, should have transparency in its processes and the administration of its funding.
 9. *Difficulties finding the right number of reviewers with the appropriate subject matter expertise*; this is particularly problematic for new and emerging areas of research where finding knowledgeable

reviewers, with no conflicts of interest, is more challenging. While CIHR's changes to the peer review process has received public criticism in recent years and NSERC's modified Discovery Grant review process is arguably inferior to what previously existed; SSHRC's current review system is positively received. The CCR supports in-person meetings when possible to adjudicate grants, but acknowledges that, in some cases, there can be value in virtual elements within the peer review process. Each Council that implements a peer review process must ensure that the process will deliver the best and fairest outcome for those grant proposals worthy of funding.

Support for Students and Early-Career Scientists

Students represent the next generation of researchers who, as highly-trained and skilled workers, will contribute to Canada's science culture by making ground-breaking discoveries and tackling the many economic, social, and cultural challenges facing Canadians, which again can help Canada's people, businesses and communities. Historically, the thinking was that students represented our next generation of academics. As underfunding has limited the opportunities for tenure-track appointments, students are often choosing to, or effectively being forced to, pursue non-academic-based positions. The federal government should consider options to increase faculty complement, as there is a danger that continued underfunding will lead to a lack of qualified professors.

The CCR recognizes the government's support for students in the form of additional grant funding, loan repayment, and tax credits. It also recognizes the investments for post-doctoral research partnerships; however, continued investments in graduate scholarships, internships, fellowships, and cooperative placements across the humanities and the natural, health, and social sciences are needed – either through the granting councils directly or through the funding of not-for-profit organizations – as long as transparency and accountability requirements are met. The federal government should undertake a review of its current suite of programs and delivery mechanisms to support internships and cooperative placements.

For example, continued support for internship and fellowship initiatives across a diversity of disciplines and settings, particularly those with not-for-profit organizations that don't have an economic focus, in the social sciences and humanities, and in high-demand fields, would have positive impacts on students and employers, both within Canada and internationally (e.g. closing the gap in graduation rates vis-à-vis those in peer countries; positioning Canada internationally as a solid training ground and Canadian students as highly qualified personnel).

Supporting graduate-level teaching, research, and experience will encourage Canadians to pursue graduate-level education and build a foundation for economic and social development. Real-world experience gained through internships will help them find meaningful research jobs or other high-quality employment. This would in turn boost economic growth and drive innovation; the broad impacts of which are better jobs and higher productivity. Measures also need to encourage the hiring of public scientists as they represent a credible and necessary research force. Attracting young science talent to the public service will also help rebuild science capacity to meaningful levels.

In addition to the insufficient numbers of scholarships, internships, and fellowships for students and early-career scientists, researchers and students have also noted other changes in programs that have created challenges and/or roadblocks, including but not limited to:

- Difficulties recruiting students to universities because of limited dollars and positions
- In the case of NSERC specifically, reducing its funding for master's students from 2 years to 1 year; master's degrees are rarely completed in one year.
- Again in the case of NSERC, reducing the number of times an individual can apply for a post-doctoral fellowship from 2 to 1
- Challenges with harmonization of fellowship procedures: 1) the number of fellowships a university gets is based on previous years and thus limits growth opportunities; and 2) the lack of consequences for universities who are not following communication restrictions, thereby negatively impacting those who do
- High-income scholarships that benefit only a few students, whereas more scholarships of lesser, but still reasonable, amounts would provide funding for more students
- Lack of opportunities for paid research internships within industry
- Lack of paid internship opportunities where students with applicable basic and applied skills can train in federal government departments
- Lack of funding availability (outside of university or faculty funding) for students to travel to and attend conferences where they can both present their work and network with colleagues as well as potential graduate supervisors and/or employers – this follows from the government's 2012 to eliminate SSHRC's Aid and Attendance Grants to Scholarly Associations (AAGSA) program; such a program within all granting councils would be extremely beneficial

In addition to insufficient funding for students, there is also insufficient clarity on "how to support them". Over the last 10 years, SSHRC has encouraged researchers to include more student support in their budget (e.g., stipends rather than RAs), and then penalized those same researchers for supporting their students by failing their grant application in the budget criterion.

The best students are strongly attracted to organizations that excel. Efforts to support and promote institutions that foster excellence will be rewarded. Investments in universities, colleges, and research facilities within all sectors across Canada will help Canadians pursue and complete higher studies and acquire new skills. These investments will foster the next generation of researchers who will tackle the many economic, social, and cultural challenges facing Canada in the coming decades.

The CCR encourages the panel to review who is funding students, and in what manner, and if these models and funding levels remain in the best interest of Canada and its students.

RECOMMENDATION 2: ENSURE LONG-TERM AND STABLE FUNDING FOR KNOWLEDGE INFRASTRUCTURE

Research Infrastructure

Canada has done an excellent job of investing in some aspects of its research infrastructure. For example, Compute Canada (<https://computecanada.ca>) offers high performance computing resources to Canadian scientists free of charge, providing them with the tools they need to compete on the world stage in computational neuroscience, formal analysis, and artificial intelligence.

However, Canada's dedication to research has fallen short elsewhere. For example, the decision to terminate the MRI facilities in the National Research Council Institutes for Biodiagnostics (NRC-IBD) in Winnipeg, Calgary, and Halifax had many negative effects. First, tools and trained technicians were no longer available to our researchers. Second, research programs that had depended on the neuroimaging equipment and technicians in the NRC-IBD were severely disrupted. Third, science/industry partnerships were severely impacted. For example, shutting down the MRI research equipment in NRC-IBD Winnipeg precipitated the relocation of a world-class biotechnology company (i.e., IMRIS, <http://www.imris.com/>) to Minneapolis. This is a problem for a number of research sites in Canada.¹

We encourage the Government of Canada to recognize and maintain its existing assets as it works to build new ones. Stabilized operating funds for universities, government departments, and data collection agencies are needed to maintain and expand research infrastructure, support data management, and continue to conduct research used to: enhance the well-being of Canadians; ensure the success of the businesses in which they work and communities in which they live; and support a strong science culture upon which the development of good policy and programming is based.

Investments have been made in world-class research infrastructure to cover the indirect costs associated with conducting research, as evidenced by funds allotted to the Canada Foundation for Innovation (CFI), to universities doing federally-supported research, and to previous iterations of the Indirect Research Costs Program. However, more stable and predictable funds are necessary; it is critical to support the short- and long-term operational and maintenance requirements of existing regional, national and international research labs.

Funding for Equipment

In addition to funding for indirect research costs, each tri-council needs to ensure the availability of stable funds for the timely funding of smaller-scale equipment and equipment needed to pursue rapidly emerging research directions in individual laboratories.

In 2012, NSERC announced the cancellation of its RTI envelope following its 2013 competition; this was a fund specifically for equipment as described above. With its cancellation, researchers were told to apply for funds for equipment from CFI; this was incorrect to say as individual researchers cannot apply for funds for small-scale equipment through CFI as it only provides funds to institutions and only for large-

¹ <http://www.cbc.ca/fifth/blog/federal-programs-and-research-facilities-that-have-been-shut-down-or-had-th>.

scale equipment. In a similar fashion, CIHR also announced that equipment could not be funded through its Foundation and Project Grants. The CCR was one of many associations to raise this issue on behalf of its members; in response, NSERC reinstated a semblance of the RTI – funds would be available for equipment, albeit not from a dedicated equipment fund but rather from any surplus funds NSERC had at year-end; and CIHR changed its rules to allow equipment funds to be included in its recent Foundation and Open Project Grants.

Scientific tools are a necessary component of basic research and any decrease in funding for such tools is ultimately counterproductive. The CCR appreciates that the funding councils have sought ways to find savings in the past as part of the previous Government's efforts to return to balanced budgets. However, Government and Canadian stakeholders are also committed to a thriving and successful society and economy – the advances and innovations of basic research are central to achieving these objectives, but will only be realized if researchers can look to the three councils for stable funds for small-scale equipment and equipment for rapidly emerging research.

Research in Non-Academic Settings

It is also important to provide sustained support for the continuation of research in non-academic based settings such as, but not limited to:

- Library Archives Canada, which has the capacity to collect, preserve and make available data specific to Canada's cultural heritage used by researchers, students, policy makers, historians, genealogists, indigenous communities, journalists, and the general public
- Statistics Canada, which provides a mechanism for reliable regular data collection on a national scale
- Canadian Institute for Health Information, an independent, not-for-profit organization that provides essential information on Canada's health system and the health of Canadians.
- National Research Council, the Government of Canada's premier research and technology organization.

With respect to Statistics Canada specifically, a strong science culture relies on the availability of national statistics with common data points. Data and research that are collected and conducted over a long term in a standardized manner from a representative sample can be meaningfully used by researchers, government, industry, business, not-for-profits, municipalities, and communities to inform policy, direct innovation, influence economic and social prosperity, examine socio-economic issues, and improve productivity, economy and health.

The CCR was pleased the Liberal federal government quickly reinstated the mandatory long-form Census upon its election to government. The CCR and its members had been calling for its reinstatement since the survey was cancelled in 2010. Having access to the national statistics obtained by the long-form Census ensures researchers are working from a common set of data points when considering issues of common concern and will help researchers best inform public policy and direct innovation; sadly, there will always be a gap reflective of the years it was cancelled, which we won't ever be able to fill.

Other key surveys to the research community that have been discontinued include the University and College Academic Staff System (UCASS), the Survey of Earned Doctorates (SED), the Youth in Transition Survey (YITS) and the National Longitudinal Survey of Children and Youth (NLSCY). The Cancellation of the NLSCY and YITS has left significant gaps in our ability to track child and youth development and labour market trends among youth, while the cancellation of the UCASS and SED left significant gaps in our ability to track the number and demographic distribution of academics in Canada; as such, the CCR was extremely pleased to hear of the UCASS's reinstatement in early September of this year, having long advocated for its reinstatement.

The CCR strongly supports the establishment of a system that would prevent the cancellation of these types of surveys that underpin a broad range of research without broad stakeholder consultations and support.

RECOMMENDATION 3: SUPPORT A NATIONAL SCIENCE POLICY AGENDA AND A SCIENCE CULTURE IN CANADA

Science – social, natural and health – is a fundamental part of Canada, having relevance to societal well-being, human functioning, health, technology, innovation, productivity and the economy; its relevance can be measured at the individual, business, and community levels.

According to the Council of Canadian Academies, “a society has a strong science culture when it embraces discovery and supports the use of scientific knowledge and methodology. Such a culture encourages the education and training of a highly-skilled workforce and the development of an innovative knowledge-based economy.” Investments in a science culture will contribute to more and better-paying jobs, new inventions and patents, increased productivity, increased government revenues over the medium- to long-term and an increased standard of living for Canadians – all of which will contribute to helping Canada's people, businesses, and urban/rural/remote communities. Such investments will also help to secure Canada's place as an international destination that supports a science culture for the public, evidence-based policy, and current and future researchers.

One of the key issues affecting science and innovation in Canada is the lack of a national science policy agenda that cross-cuts the humanities and the natural, social and health sciences, and an accompanying scientific advisory body structure that is unbiased and transparent in its decision-making.

Canada currently does not have enough to support a science culture, whether in the form of grants for operating funds; funding for indirect costs related to research infrastructure and operating costs; funding for small- and large-scale equipment; scholarships, fellowships, internships, and cooperative placements for students and new graduates. Further, the absence of a science agenda and formal scientific oversight has led to:

- vulnerabilities in Canada's national data infrastructure
- significant decreases in research funding in Canada
- significant variation in the distribution of funds to the granting councils

- fundamental shifts in the nature of research a given agency funds, how research is reviewed, and what types of research are funded
- lack of transparency in the administration of funding

In addition, often times, decisions have been made without any consultation with the research community and/or individuals that are directly impacted by the decisions. There also seems to be little evaluation of whether current processes/arrangements are working (for example, are excellence-based systems working? What outcomes are associated with funding projects versus funding programs?) History has also shown a tendency to create a new agency every time a gap is identified, rather than assessing whether an expansion of the role of an existing agency might be the optimal mechanism, both from an operational and a financial point of view.

The public and policy makers would benefit from establishing an unbiased and transparent Scientific Office, armed with a strong mandate and sufficient resources, to oversee the use of scientific evidence in policy-making, to ensure proper consultation on the future introduction and cancellation of Statistics Canada surveys, and to evaluate Canada's funding of fundamental science on a regular basis.

The CCR is thankful for the opportunity to make this submission for consideration by the panel overseeing Fundamental Science in Canada. We are happy to consult and/or provide further information as necessary (613-237-2144 ext. 323 or executiveoffice@cpa.ca)

Appendix A. Members of the CCR

1. **Canadian Association for Graduate Studies (CAGS)**

CAGS brings together 52 Canadian universities with graduate programs, three national graduate student associations, the three federal research-granting agencies and organizations having an interest in graduate studies. Its mandate is to promote graduate education and research in Canada.

2. **Canadian Association of Physicists (CAP)**

CAP is a broadly-based national network of physicists working in Canadian educational, industrial, and research settings. CAP is a strong and effective advocacy group for support of, and excellence in, physics research and education. It represents the voice of Canadian physicists to government, granting agencies, and many international scientific societies. CAP is an enthusiastic sponsor of events and activities promoting Canadian physics and physicists, including its annual congress and national physics journal.

3. **Canadian Association of Research Libraries (CARL)**

CARL provides leadership to the Canadian academic research library community through enhancing scholarly communication and assisting members to provide full support for postgraduate study and research.

4. **Canadian Association of University Teachers (CAUT)**

Founded in 1951, CAUT is the national voice for academic staff. Today, representing more than 68,000 teachers, librarians, researchers and other academic professionals and general staff, CAUT is an outspoken defender of academic freedom and works actively in the public interest to improve the quality and accessibility of post-secondary education in Canada.

5. **Canadian Astronomical Society (CAS)**

CAS was founded in 1971 and incorporated in 1983 as a society of professional astronomers. The Society is devoted to the promotion and advancement of knowledge of the universe through research and education. Membership is open to persons with a professional involvement with these goals in astronomy and the related sciences. The main activities of the Society are its annual scientific meetings, the planning and realization of scientific projects, the support of the scientific activities of its members, and the dissemination of related information among members and other interested persons. The Society supports committees on Optical and Infrared Astronomy, Radio Astronomy, Space Astronomy, Theoretical Astronomy, Education, Heritage, Canadian Grad Students, and Awards. Cassiopeia, the quarterly newsletter of the Society, is published at equinoxes and solstices.

6. **Canadian Council of the Deans of Science (CCDS)**

The mandate of the CCDS is to promote excellence in scientific research and education in all Canadian Universities, and to promote the importance of scientific research, education and literacy to all levels of government, industry and the public sector.

7. **Canadian Council of University Biology Chairs (CCUBC)**

The CCUBC is comprised of the Chairs or Heads of Biology Departments from most universities in Canada. Chairs play a key role in the leadership of Biology Departments and the improvement of Biology research and teaching in Canada. CCUBC strives to provide a forum for exchange of information between Chairs for improving Biology teaching and research in Canada.

8. **Federation for the Humanities and Social Sciences (FHSS)**

With a membership now comprising over 160 universities, colleges and scholarly associations, the Federation for the Humanities and Social Sciences represents a diverse community of 91,000 researchers and graduate students across Canada. The Federation organizes Canada's largest academic gathering, the Congress of the Humanities and Social Sciences, bringing together more than 8,000 participants each year.

9. **Canadian Federation of Students (CFS)**

CFS is Canada's largest student organisation. It is composed of over 80 university and college students' associations in ten provinces with a combined membership of over one-half million students.

10. **Canadian Geophysical Union (CGU)**
CGU began as a society dedicated to the scientific study of the solid earth and has evolved into one that is concerned with all aspects of the physical study of Earth and its space environment, including the Sun and solar system.
11. **Canadian Mathematical Society (CMS)**
The goal of the CMS is to promote and advance the discovery, learning and application of mathematics.
12. **Canadian Meteorological and Oceanographic Society (CMOS)**
CMOS is the national society of individuals and organisations dedicated to advancing atmospheric and oceanic sciences and related environmental disciplines in Canada. CMOS aims to promote meteorology and oceanography in Canada; it is a major non-governmental organisation serving the interests of meteorologists, climatologists, oceanographers, limnologists, hydrologists and cryospheric scientists in Canada.
13. **Canadian Organization of Medical Physicists (COMP)**
COMP is the main professional body for medical physicists practicing in Canada. The membership is composed of graduate students in medical physics programs, post-doctoral fellows, as well as professional physicists, scientists, and academics located at universities, hospitals, cancer centres, and government research facilities such as the National Research Council. Every member has an educational or professional background in physics or engineering as it applies to medicine.
14. **Canadian Psychological Association (CPA)**
The CPA was organized in 1939 and incorporated under the Canada Corporations Act, Part II, in May 1950. Its objectives are: To improve the health and welfare of all Canadians; to promote excellence and innovation in psychological research, education, and practice; to promote the advancement, development, dissemination, and application of psychological knowledge; and to provide high-quality services to members.
15. **Canadian Society for Brain, Behaviour and Cognitive Science (CSBBCS)**
CSBBCS is a non-profit organization whose primary function is to advance Canadian research in experimental psychology and behavioural neuroscience.
16. **Chemical Institute of Canada (CIC)**
The CIC is a professional association of chemists (Canadian Society for Chemistry), chemical engineers (Canadian Society for Chemical Engineering) and chemical technologists (Canadian Society for Chemical Technology) who are employed in, or associated with industry, academia, government and other organizations across Canada and the world.
17. **Council of Canadian Departments of Psychology (CCDP)**
Formed in 1999, the primary objectives of the CCDP are to represent and promote psychology as a scientific discipline inside and outside university settings. It serves an advocacy and informational role with regional and national agencies which provide research and scholarship funds, and provides leadership and perspective in the areas of undergraduate and graduate education, program accreditation, and research that takes place within departments of psychology. The CCDP has over 60 members from institutions across the country.
18. **Council of Canadian University Chemistry Chairs (CCUCC)**
...representing over 60 Universities.
19. **Professional Institute of the Public Service of Canada (PIPSC)**
The mission of PIPSC is to represent members collectively and individually, by providing bargaining, labour relations and other member services; by promoting and defending the rights and interests of members; and by safeguarding and promoting professional standards.
20. **Statistical Society of Canada**
The mission of the SSC is to encourage the development and use of statistics and probability.