



Science Day in Canada

Keynote Speech

Stimulating an Ailing Economy: The Crucial Role of Science, Technology, and Innovation

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Introduction

I wish to begin by thanking the Public Policy Forum for organizing this event and by thanking each of you – as members of the science, business, and governmental communities – for your attendance and participation.

We are meeting at a time when our country – indeed the world – faces the challenge of a severe economic downturn affecting the lives of millions of people

At such a time, it seems to me to be extraordinarily important that the relationship between the Science, Technology, and Innovation community and the business and political communities be *as solid, transparent, harmonious, and productive as possible*

Why? Because as we have heard today, science, technology, and innovation (STI) has made enormous contributions to the social and economic wellbeing of our country in the past, and because the world of tomorrow will be powered by knowledge, shaped by science, molded by technology, and led by innovation.

For the contributions of STI to be optimized, however, the relationship between the STI community and the business sector – businesses as an innovator employing both technology and science – must be as solid as possible. And for the contributions of STI to be optimized for the benefit of society as a whole, the relationship between the STI community and governments – governments as policy-makers and funders – must also be *as solid, transparent, harmonious, and productive as possible and not weakened in any way by uncertainty, misunderstandings, or needless conflict.*

As a non-expert, but someone with associates and friends in all three communities, I would like to put forward some suggestions for making these relationships stronger and more satisfactory for all concerned.

The Canadian Vision

One of the chief means of strengthening relationships among any group of people or interests is agreement upon a common vision, so let me start there.



Over the last several months, Prime Minister Brown¹ in the United Kingdom and President Obama² in the United States have delivered substantive addresses on what they expect science to contribute to addressing the challenges faced by their own countries and the global community.

Like you, I have been encouraged and inspired by these commitments, particularly with respect to the opportunities they create for international cooperation among scientists to address such pressing challenges as economic recovery and improving our approaches to public health, energy security, and environmental conservation.

As a Canadian, I could not help but notice that both Prime Minister Brown and President Obama made reference in the introduction to their remarks to the fact that the organization of science and its harnessing to national purposes began in both their countries during a time of war. In the case of the United Kingdom, founding members of what was to become the Royal Society first met in Oxford during the English Civil War. And, as President Obama observed, President Lincoln signed into law the act creating the National Academy of Sciences in the midst of the American Civil War.

As a Canadian, I believe it is significant and worth recalling that the initial organization of science in our country, and its harnessing to public objectives, had a very different origin and thrust.

Most Canadians know the story of how Canada began as a country – how a few farsighted leaders pursued a vision to unite the British North American colonies into one nation under a federal constitution, to integrate the colonial economies into a single national economy, to provide for future development by acquiring the vast lands and resources of Rupert's Land, and to bind the whole enterprise together by building the longest railway in the world. This, to use Pierre Berton's phrase, was 'The National Dream.

But what few of us fully appreciate is that there was also a science-based dimension to that story and vision. A generation earlier the leaders and people of those same British North American colonies launched a scientific endeavour which was to contribute as much to the building of Canada as the BNA Act and the Canadian Pacific Railway. It was called the Geological Survey of Canada³ and began with a £1500 grant from the legislature of the United Colony of Canada to carry out a geological survey of its territory.

After Confederation in 1867, the Geological Survey of Canada was expanded to become the principal science based endeavour of the new federal government. Under the leadership of able scientific directors such as William Logan, G. M. Dawson, and J. B. Tyrell, its dedicated personnel methodically surveyed and catalogued the minerals, soil, climate, water, and forests of Canada – the material basis of the Canadian economy and the first scientific description of our country.

¹ "Science and our Economic Future, the Romanes Lecture given by the Prime Minister at the Sheldonian Theatre in Oxford on 27 February 2009. Transcript at <http://www.number10.gov.uk/Page18472>.

² Remarks by the President at the National Academy of Sciences Annual Meeting, Washington DC, April 27, 2009. Link to text, http://www.whitehouse.gov/the_press_office/Remarks-by-the-President-at-the-National-Academy-of-Sciences-Annual-Meeting/

³ A history of the Geological Survey of Canada can be found on the website of Natural Resources Canada at http://gsc.nrcan.gc.ca/hist/150_e.php



Why do I make reference to the historical role of the Geological Survey of Canada (which still exists today) in the formation of Canada? Because it reminds us that the Fathers of Confederation recognized that scientific investigation, and the technologies, innovations, and economic activities which flowed from it, had a vital role to play in the realization of the national vision. And if that was true in their day and generation, when many aspects of scientific investigation and technology were in their infancy, surely it is even more true today in an age when the scientific method has become the principal approach to problem solving and where science based technologies have become the principal drivers of the modern knowledge based economy.

Recalling the national vision – recalling that it includes a scientific dimension – ought to be a unifying force among us, whether we come from the science, business, or political communities. I also believe that our commitment to the scientific dimension of this national vision would be enhanced and re-enforced if from time to time our political leaders would make a specific public declaration that they too recognize and appreciate the absolute importance of Science, Technology, and Innovation to our basic understanding of the physical universe and to the realization of the particular goals and dreams of Canadians in the 21st century.

The Federal Policy Framework for the Support of Science, Technology, and Innovation

But now let me drop down from 90,000 feet to 10,000 feet. Whereas the organization of the Geological Survey of Canada was the framework within which Canada's first federal government sought to support and apply science to the achievement of national goals, we operate within a different and much more complicated framework today.

Many of you are much more familiar with this framework than I am; indeed, many of you have helped shape it. But let me just quickly mention its principal components:

- The federal granting councils, research organizations, and science-oriented departments and agencies.
- Our great research universities performing both research and educational functions.
- Hospitals and their research facilities which are responsible for 75% of the work of the health research sector.
- The Big Science projects to which Canada is committed.
- Programs like the Industrial Research Assistance Program (IRAP) and the Scientific Research and Experimental Development (SRED) tax credit to facilitate private-sector innovation.
- The provinces, not only supporting their own scientific endeavours but also playing a major role in the education and training of scientific personnel.
- The current federal policy framework entitled *Mobilizing Science and Technology to Canada's Advantage* (2007), with its emphasis on promoting world-class excellence, fostering partnerships, and applied-science priorities of environment, energy, health, and information and communications technologies.

And then most recently there is the federal government stimulus package and 2009-10 Budget. As I understand it, the Government of Canada is now committed to spending some \$12-13 billion per year in support of Science, Technology, and Innovation activity over the next two years. In



particular, the 2009-10 Budget, developed in the context of the current economic downturn, provides for an overall Science and Technology Infrastructure Investment of slightly more than \$3 billion, including \$87 million for Arctic Research Infrastructure, \$250 million for Federal Laboratory Infrastructure, and \$2 billion for University and College Infrastructure over two years – investments very much welcomed by the those institutions. At the same time, the 2009-2010 Budget also provided for investments in the ongoing work of the granting councils and Genome Canada, but in amounts that generated criticism that these allocations were either inadequate or inadequately distributed.

In general terms therefore, this is the broad policy and budgetary framework within which STI in Canada is currently nurtured and applied. In many respects it has served us well, but it is complex and like most such frameworks it has both strengths and weaknesses. Its strengths include the quality of the scientific work it has facilitated and the relatively high level of financial support which it provides for public-sector-based research and development. On the other hand, a weakness still to be overcome is the relatively low level of R&D undertaken by our private sector in comparison with other OECD countries. Recent reports by the Science, Technology, and Innovation Council⁴ (STIC) and an Expert Panel organized by the Council of Canadian Academies⁵ address this problem and contain helpful suggestions for alleviating it.

A Particular Challenge

Many of you are well qualified to make substantive recommendations for improvements to this general policy and budgetary framework, but that is not the prime purpose of my remarks today. What I would like to do is to focus attention on one particular challenge which, if left unaddressed and unattended, could lead to a deterioration rather than a strengthening of the relationship between the STI community and the federal government.

As all of you well know, the challenge of properly allocating resources, in particular financial resources, by the Government of Canada in support of Science, Technology, and Innovation, has two levels and many dimensions.

At the macro-level, there is the allocation of resources by the Government among such broad categories of recipients as the research universities, the granting councils and agencies, federal research bodies, the science oriented departments, and programs such as IRAP and SRED.

At the micro or detail level there is the allocation of resources via competition among peer reviewed researchers drawing upon the various institutions and programs which provide funds to cover one or more of the four major categories of research costs – capital expenditures, personnel expenditures, infrastructure expenditures, and operating expenditures.

⁴ *State of the Nation 2008: Canada's Science, Technology, and Innovation System*. Issued by the Science, Technology and Innovation Council and available on line at www.stic.csti.ca.

⁵ *Innovation and Business Strategy: Why Canada Falls Short*. Prepared by The Expert Panel on Business Innovation as organized by The Canadian Council of Academies and available on line at www.scienceadvice.ca.



What *is* the optimal allocation at the micro or detail level that will simultaneously and adequately meet the needs of individual research projects for capital funds, personnel funds, infrastructure funds, and operating funds? An appropriate balance presumably can be found at the micro or detailed level, *provided that the high-level allocations make that possible*.

How resources are allocated at the micro or detail level has been and continues to be the subject of continuous scrutiny, evaluation, and improvement over the years. Whether or not the amounts of funds made available to this level is adequate, the principles, structures, and processes whereby these funds are allocated at the micro or detail level are generally well understood and serve the country well.

However, the principles, structures, and decision making processes whereby the macro or higher-level allocations are made are neither clear nor well understood, and this has led to significant misunderstandings that jeopardize constructive relations between the federal government and STI community.

As already mentioned, the Government of Canada is committed to spending some \$12-13 billion per year in support of Science, Technology, and Innovation activity over the next two years. But whether those funds are currently being allocated *on an optimal basis at the macro level* is a legitimate subject for debate. The allocation decisions involved at this level are complicated by many factors and competing interests. Responsibility for making them is often divided half-a-dozen ways, and the process whereby they are made is not always transparent – even to those within the government itself. This can lead and has led to misunderstandings on the part of the Government as to what constitutes an optimal allocation of these resources in the judgement of various segments of the STI community, and misunderstandings on the part of some of you with respect to the Government's intentions and commitment to the particular areas of Science, Technology, and Innovation with which you are involved.

In my judgment, *acknowledging, addressing, and eliminating these misunderstandings must be a priority* if we are to optimize the allocation of resources in support of Science, Technology, and Innovation, adequately support basic science, and maximize the contributions of STI to the wellbeing of Canadians and the task of economic recovery.

What could be done to address this challenge?

I would respectfully suggest the following steps:

1. That the Government, through the Minister of Industry, direct the Science Technology and Innovation Council (STIC) to:

- Provide an up-to-date description of how these high-level allocation decisions have been made in the past and are currently being made.
- Identify the principles on which these high-level allocation decisions should be made and the sources of advice which should be sought out in making them.



- Ascertain the most appropriate structure and process for making these high level allocation decisions in the future⁶.

Please note that I am not suggesting that the STIC come up with a “formula” which would prescribe what those high-level allocations should be. Rather I am suggesting that STIC propose *a structure and a process* whereby optimal allocation decisions can be made on the basis of sound principles and the best advice possible.

2. That whatever structure and process the STIC may recommend, one of its distinguishing characteristics must be *transparency and openness* so that all stakeholders understand how these decision are made and upon whose advice.
3. That the Government, through the Minister of Industry, also direct the STIC to conduct these inquiries as expeditiously as possible (with preliminary reports by early fall and final reports by the end of the year) and to conduct these inquiries with maximum transparency and openness.

If these suggestions were to be acted upon by the Government, I would further suggest that each of you who have demonstrated your interest in and concern with this subject by attending this Science Day in Canada, should make a special effort to submit your own best advice to the STIC⁷ on how to structure the making and communication of future high level allocation decisions.

If, in the process of conducting these inquiries, the Government should become convinced that improvements could be made in the current allocation of resources to STI, presumably it would be open to making some mid-course adjustments. And hopefully the structure and process recommended for the future by the STIC would be in place in time to govern the allocation decisions in the 2010-11 Budget and the communication of these dreams.

The Importance of This to Us All

Why is all this important to us all?

1. First, because science, especially basic science, contributes to our understanding of the place where we live – as inhabitants of this universe, planet, continent, and country.
2. Second, because science is making an enormous contribution today to our understanding of our own health – from our genetic inheritance to the health impacts of the foods we eat, from the prerequisites for good health to the nature and treatment of the diseases that afflict us. And science can make an even greater contribution tomorrow to that understanding and to the development of better foods, medicines, life styles, and the diagnostic and treatment technologies conducive to better health.

⁶ As part of this inquiry, the STIC might give particular attention to recommending some standardized definitions of the major cost components of research undertakings – i.e. capital, personnel, infrastructure, and operating. Treasury Board, the Department of Finance, Industry Canada, the granting councils, the universities, the private sector, and researchers themselves all appear to have different conceptions of what this term means and encompasses and the term appears to be used at the project level to cover buildings, laboratories, research equipment, as well as the salaries of people who manage and use infrastructure.

⁷ To secure such input from participants in Science Day in Canada, and others with interests in this subject, STIC might consider establishing an internet portal for this purpose.



3. Third, because science is making an enormous contribution today to our understanding of the ecosystems on which life on this planet depends and to our understanding of the effects which our consumption habits and economic activities are having on those ecosystems. Science – and the technologies and innovations flowing from it – can and must make an even greater contribution tomorrow to that understanding and sound environmental conservation measures flowing from it, if the integrity of our environment is to be preserved and improved for future generations.

4. Fourth, because science is making enormous contributions today to our economy, improving the productivity and competitiveness of our traditional resource and manufacturing industries, as well as forming the basis of the newer high technology and information based industries which are contributing more and more each year to our national wealth. It is my personal conviction that STI has a particularly important role to play in the process of economic recovery and in assisting Canadians to cope with the negative social and humanitarian impacts of the economic downturn.

If the Canadian auto industry or any other Canadian industry has become uncompetitive by comparison with the rest of the world, is it not improved understanding and innovation – rooted in science and technology – that must be vigorously applied to restore our competitiveness?

If petroleum produced from the Athabasca oil sands faces restricted entry to the United States because of its environmental impacts, is it not improved understanding and innovation – rooted in science and technology – that must be harnessed to find better ways of energizing the extraction process and mitigating negative environmental impacts?

If the rising costs of government services, especially health care, threaten the financial sustainability of those services as our population ages, is it not improved understanding and innovation – rooted in science and technology – that must be harnessed to make those services more cost-effective?

If the current economic downturn is having negative impacts on the quality of life of individuals, families, and communities – and it surely is – is it not the social sciences and the humanities that can increase our awareness of the human dimensions of these impacts and assist us to alleviate them?

If it is possible – and it surely is – that the application of science, technology, and innovation to all the above challenges can have unanticipated consequences, some of them negative, is it not to the social sciences and humanities that we must look to conduct the ethical, economic, environmental, social, and legal impact assessments that will forewarn us of those negative possibilities and enable us to avoid or mitigate them?

And if the up-and-coming generation needs to be better equipped than our generation with the knowledge and tools required to face the challenges of the future and to be inspired with the prospects of great adventures, does not science, technology, and innovation have a huge role to play in providing that foundation and inspiration?

Conclusion

We know that Canadians are capable of the highest achievements in science as demonstrated by our record in winning Nobel Prizes for science:



- Gerhard Herzberg, Henry Taube, John Polanyi, Sid Altman, Rudolph Marcus, and Michael Smith – all winning Nobel Prizes for their work in chemistry;
- Richard Taylor from my home province of Alberta, and Bert Brockhouse, winning Nobel Prizes in physics; and,
- Frederick Banting, Andrew Schally, and David Hubel, winning Nobel Prizes in medicine.

We also know that Canadians are capable of the highest achievements in conflict resolution and peace-making as demonstrated by the winning of the Nobel Peace Prize by a distinguished politician, the Rt. Hon. Lester B. Pearson – the ability to reconcile conflicting interests as distinct from exploiting them being what distinguishes the statesman from the partisan politician.

All of which leads me to believe that the practice of science, vigorously and wisely supported, has much to contribute in future to conflict resolution and peace-making both abroad and at home.

In the turbulent global political community of which we are a part, the international collaborations of the scientific community are a shining example of activities that transcend old animosities, boundaries, and barriers, leading us to believe that the advancement of science is conducive to the advancement of international peace.

In our turbulent domestic political arena – including the current minority Parliament – it is difficult to find any subject of national importance with the capacity to transcend party politics and regional divisions. But it is my earnest hope that the widespread agreement on the importance of Science, Technology, and Innovation and its role in assisting us to cope with the stresses and strains of the economic recession might enable our Members of Parliament to transcend party lines, to resist the temptation to make the funding of science a political football, and to agree on an optimal approach to the support of Science, Technology, and Innovation that will be of benefit to all Canadians.

In so doing, we will be recapturing the spirit of that original Canadian dream – a dream which also transcended partisan and regional barriers – that envisioned science not as a handmaid of war but as an instrument of peaceful exploration, discovery, and human progress.

Thank you.