CANADIAN FEDERATION OF BIOLOGICAL SOCIETIES

FÉDÉRATION CANADIENNE DES SOCIÉTÉS DE BIOLOGIE

Capacity for Innovation

Recommendations / Solutions

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EXECUTIVE SUMMARY

The Federal Government has embarked on an innovation strategy that is aimed at making Canada one of the top 5 nations in research and development. In furthering this strategy the Government has created the Canadian Foundation for Innovation, Genome Canada, the Canadian Institutes for Health Research and the Canadian Research Chairs Program. The life sciences community has responded positively to these initiatives since it believes that they will enable our country as an innovative and productive society. The following brief focuses on Canada's need for highly qualified personnel and attempts to identify solutions to the problems that the Government may encounter in achieving the goals of its innovation strategy.

RECOMMENDATINS:

We encourage the federal government to pursue its stated aim to move Canada to the 5th position among the developed nations in research and development. This action will improve the research environment by providing the granting councils with sufficient funds to underwrite the creative talents of Canadian researchers.

Productivity in research and innovation depends on having the right people with the right training. We support the expansion of both the range of opportunities for post secondary education and the strategies for the retention of our active researchers.

We encourage the federal government to monitor the effects of university-corporate partnerships to ensure that a healthy balance is maintained between curiosity-driven and applied research.

That for the health of the Canadian economy, the federal and provincial governments cooperate to develop an effective policy regarding the funding of post secondary education to ensure that Canada has the personnel to respond to the innovation strategy.

SOLUTIONS:

1. For more efficient use of federal funds, we would encourage the federal government to develop a mechanism that would incorporate a 3-year rolling average in the federal budget for the allocations to granting councils.

2. For greater accountability, we suggest the use of the granting councils to provide an effective and transparent mechanism for monitoring the expenditures provided in the allocation of "indirect-costs" of research.

3. To encourage greater involvement of Canadian Corporations in research, we would suggest extensions of the Federal Interchange Canada Program (sponsored by Treasury Board) to partnerships between the corporate and university sectors.

4. To attract and retain the next generation of scientist, we would encourage the federal government, through the granting councils, to use training initiative to ensure that our potential scientists do not incur massive debt obtaining undergraduate and graduate training. We support the expansion of programs such as the Canada Research Chairs to retain researchers and attract our best and brightest young scientists to careers in innovation.

The Canadian Federation of Biological Societies (CFBS) represents the members of 13 Canadian Life Science organizations from across the Country. CFBS' mission is to promote research, facilitate the dissemination and economic use of knowledge in the Life Sciences and to contribute to the development of a forward-looking science policy for Canada.

INTRODUCTION

The Federal Government has pledged, as a stated aim, to move Canada from 14th to 5th position among the developed nations in its investment in research and development. The intent to achieve this goal has been warmly applauded by the research community. This "brief" has been written; therefore, in an attempt to identify key issues, which if addressed, we believe will assist the Government to be successful in pursuing its innovation strategy.

Having decided that the Country should become more innovative and productive, the Federal Government
Has embarked on a series of initiatives that it believes will assist in achieving these goals. The past several years have seen the unveiling of the Federal Government's "innovation strategy". Contributing to this initiative has been the creation of the Canadian Foundation for Innovation (CFI), the Canadian Institutes of Health Research (CIHR), the Research Chairs Program, the millennium scholarships and, more recently, the first phase of investments in "indirect costs" of research.

Reaching the Government's goal will provide the funding required by researchers to effectively attack issues related to human, environmental and economic health. Underlying this strategy is the critical need for personnel to implement the innovation agenda.

THE NEED

Canada's ability to compete internationally relates directly to our capacity to satisfy our manpower requirements. In his last report the Auditor General, Denis Desautels, indicated that, during the first 10 years of this century, the Federal public service expects between 7,000 and 9,000 employees per year to retire. Currently, 63% of the government jobs require a university degree compared to 46% 20 years ago.

As the current wave of retirements occurs in universities, it is estimated that 30,000 faculty members will have to be found over the next decade. Demographics dictate that a large exodus of highly skilled scientists can be expected from industry in this same time period. Finally, a survey of independent businesses has suggested that as many as 300,000 jobs in small- and medium-sized firms remain unfilled, in part, because of a shortage of workers with the capabilities to fill them. Whatever the precise number, what is clear is that Canada's ability to recruit well educated/trained individuals is critical to our survival as an innovative and more productive society. One approach the Government envisages is recruiting from abroad. **Since the demand for highly qualified personnel is expected to be universally high in developed countries, this strategy may have limited success unless the environment for innovation**

is exceptional in Canada. A British government report (Roberts, Sir G., SET for success, The supply of people with science, technology, engineering and mathematics skills, HM Treasury, UK Government 2002) highlights the decrease in enrolment rate in areas of science where there is an increasing demand for these individuals thus emphasizing the continuing need to attract the best people into these careers.

An article in the April 24th, 2002 Ottawa Citizen quotes the CD Howe Institute study "Renovating the Ivory Tower" which notes that Canadian Governments' financial support for universities has fallen far behind public support given U.S. universities. This study, that reinforces the need for greater attention to our postsecondary institutions, concludes that the decreased expenditures over the past two decades may help explain Canada's lagging living standards.

EDUCATION

To perform effectively as an "Innovative Society" Canada requires individuals with the skills necessary to insure that the funds invested in innovation can be used to their greatest effect. *"Without a substantial increase in the proportion of young Canadians undertaking post-secondary studies and going on to obtain graduate degrees that our labour market demands, Canada will be unable to improve productivity or fully seize the opportunities that the new knowledge-based economy offers."*[1]

While this has been a stated concern of the recently published "Canada's Innovation Strategy" there is a growing unease regarding our capacity to generate the individuals needed to ensure that this Country maintains a competitive edge as a progressive and innovative society. Increasingly, more complex societies demand the availability of well-educated populations. Consequently, attempts to satisfy our highly qualified personnel needs by depending on individuals from offshore may not be an effective solution. In this regard, it is important, therefore, that Canada harvests its best minds much as it would if it were attempting to obtain the highest yield of a crop of wheat. In other words, we must insure that the best possible conditions are in place for growth to occur.

To attain this goal our educational institutions must be able to offer training with both outstanding professors and facilities that meet the definition of the highest international standards. Secondly, the Country must strive to ensure that all young minds capable of being challenged have access to higher education.

1. Attracting University Faculty Members

With few exceptions, it would appear that the Federal and Provincial Governments have not developed a joint vision in promoting Canada's highly qualified personnel requirements. As a consequence the quality of post-secondary education has suffered. University facilities have deteriorated badly. Laboratory offerings to science students have been reduced resulting in limited hands-on experience. The learning exercises performed frequently make use of decrepit and out-of-date instrumentation. The erosion in quality of the undergraduate experience has persisted for two decades during which time students have been required to invest more money in tuition for declining offerings.

During the 1990's, because of insufficient funding available (**see Fig. Page 2**), to cover their operating costs, universities across Canada reduced the number of faculty members, (and support staff). The ultimate effect of this action was not only to increase faculty members' workload but also to significantly reduce meaningful interaction between student and professor, create obstacles to development of new courses and areas of instruction. The resultant increase in

teaching and committee responsibilities compromise the ability of university scholars to compete, at an international level, in their spheres of research. Given that Universities perform 31% of Canada's R&D these actions threaten this country's research capacity.[2] In an attempt to alleviate this situation the Federal Government created the "Research Chairs Program" an initiative that will see the funding of 2000 research professors in Canadian academic laboratories. This program is designed to recruit expatriate Canadians back to Canada and to retain our top researchers. Considering Canada's requirements for highly qualified personnel over the next decade additional means are necessary to attract the individuals to educate the next generation of scientists.

For a number of reasons the ability of universities to attract quality academics has diminished. In the latter part of the last century the majority of those studying for a doctoral degree had aspirations to become a university professor. Such individuals spend a considerable period after their undergraduate experience, often 6-8 years, developing the credentials that allow them to compete for available faculty positions. This means that at the age of 30-35 (following the PhD and post doctoral training) an individual is eligible for a university post. The current academic environment with its withering infrastructure and inadequate operating budgets has reduced considerably the allure of academic life. Creation of the Canadian Foundation for Innovation has contributed greatly to improving the morale of investigators by providing instrumentation that allows Canadian researchers to compete more effectively internationally. More recently (December 2001) the Federal budget has helped universities by providing support for the indirect costs of research previously provided by universities from their operating budgets. These federal programs have the potential to dramatically improve the academic environment encouraging our best minds to pursue careers in innovation

Our ability to attract outstanding academics is further impeded by the salary structure within most institutions. The Globe and Mail Magazine (March 2002) reported, "Approximately half the assistant professors earn between $ 26,704 and $ 45,522. According to the most recent numbers from Statistics Canada the average professorial salary declined by 2.2% between 1992-93 and 1998-99". This has occurred at a time when the best qualified individuals are needed to produce the scientists to meet the challenges of the Country's Innovation Strategy. Consequently, given the state of university facilities, the perceived lack of response by Provincial Governments in maintaining excellence in its post secondary institutions, it is not surprising that many of our brightest minds are considering other career options. The Federal Government can have a direct impact on quality and productivity of our academic scientists and universities by expanding the successful Canada Research Chairs program with specific focus on university professors that contribute to the training of undergraduate and graduate students.

2. Attracting Students into Undergraduate and Graduate Programs

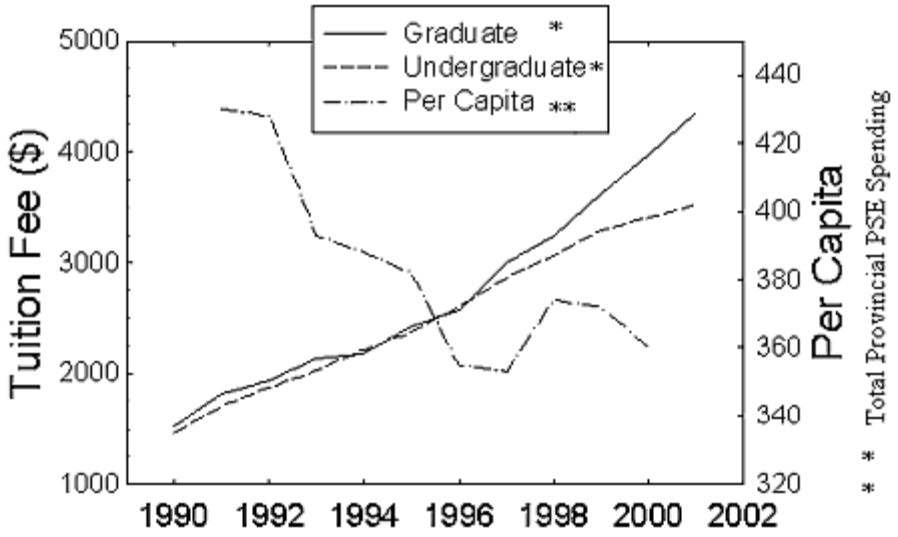
"To reach the knowledge performance target of becoming one of the top 5 countries for R&D performance by 2010 we will need at least to double the number of research personnel and foster a "strong management class".[3]

In addition to concerns related to academic recruitment is the Country's ability to insure that the best young minds are encouraged to enter both undergraduate and graduate programs regardless of their economic status.

In the absence of adequate university operating budgets much of the financial shortfall has been downloaded onto the students in the form of increased tuition costs. While it may be reasonable to expect a student to contribute to her/his education there comes a point where the level of tuition becomes counterproductive. Not all bright and creative minds come from wealthy families. As costs to attend university increase, a drop can be expected in the number of individuals from

lower and middle-income families in post secondary institutions. Those who do attend, upon graduation, will have increasingly larger debt loads. Currently, it is not unusual for students to have debts between $ 25- 30,000. This level of financial obligation then creates a deterrent for those creative individuals capable of entering graduate programs/research careers and compels them to consider other career options. Consequently, because of inadequate university operating budgets, and the resultant increase in tuition and other fees, a progressively larger number of capable individuals are disenfranchised from considering additional training in areas that will contribute to Canada's economic well-being.

The figure below documents the average increase in tuition costs during the past 10 years (data kindly provided by the Association for Universities and Community Colleges (AUCC) and Provincial Post Secondary Education Spending (Statistics Canada).



* Source: Data Kindly provided by AUCC
** Source: Calculations based on Statistic Canada, Provincial and Territorial General Government Revenue and Expenditures, Financial Management System Basis

Statistics Canada has documented (see table) a drop in the number of individuals receiving undergraduate qualifications between the years 1994 and 1998. During this same time period a small increase (4.4%) occurred in those earning postgraduate qualifications. These data are of concern given the current requirements for highly qualified personnel. Since 1998 the number of individuals entering undergraduate programs has increased. Unfortunately, the lack of response by provincial governments to financial needs of universities will result in an erosion of the quality of undergraduate education.

University Qualifications Granted by Level - Canada*					
Year	1994	1995	1996	1997	1998
Total	178,074	178,066	178,116	173,937	172,076
undergrad	150,879	150,803	150,282	146,297	143,682
graduate	27,195	27,263	27,834	27,640	28,394

Data obtained from Statistics Canada*

The recent census data fail to provide much comfort regarding the availability of university age young people to contribute to Canada's future development. As the birth rate drops fewer individuals will enter post-secondary institutions creating a deficit in our employment needs. To cushion this effect it is important, therefore, that, at present, we remove impediments to ensure that all individuals capable of entering undergraduate and graduate programs are encouraged to do so. This is essential if Canada is to maintain and/or increase the participation rate of eligible individuals. *It is vital; therefore, that an arrangement be developed between the Federal and Provincial Governments to arrest the down loading of operating costs of universities onto students.* A high priority item should be to improve the ability of post secondary institutions to do their job by addressing their financial requirements.

The Canadian Federal December 2001 budget helped relieve, in part, some of the pressure on university finances by funding a portion of the indirect costs of research. This move will assist universities by compensating them for their contributions made from operating dollars designated for undergraduate programs. What is needed to complete this valuable Federal Government contribution is implementation of an indirect cost program that is transparent and accountable. In spite of this very positive move by the Federal Government, large deficits still exist in postsecondary education budgets. Thus, tuitions are unlikely to decrease. The federal government has a opportunity to attract the best students to pursue graduate education by expanding the ability of granting councils to support training initiatives. These initiatives go a long way towards making our universities more effective in the production of high calibre personnel. However, for this strategy to be successful over the long term a meaningful solution will have to be found, based on cooperation between Federal and Provincial Governments if universities are to function effectively in the production of high calibre personnel.

3. Role of Universities

At a time when our need is greatest there remain obstacles that prevent the Country from developing the human capital it requires. It is interesting to note that, in the US Congress, a bipartisan bill the "Technical Talent" Act has been introduced. During the March 7, 2002 hearings witnesses emphasized the importance of research opportunities for students and their teachers, resources of good quality laboratory equipment and mentoring. At these hearings it was also noted that undergraduate institutions that provide such an environment produce more students that enter graduate programs than those that failed to provide such an environment. With bipartisan support it appears likely that funding for this bill will be forthcoming. Consequently, if we wish Canada's universities to play the role expected of them an improvement of the current learning environment is required.

4. University-Corporate Partnerships

Much of the Federal Government's recent strategy has been directed to obtaining greater involvement by the private sector in investing in research in Canada. The university community has a role to play in this endeavour. Universities can help ensure that novel ideas, arising from university laboratories, are available for commercialization by Canadian companies. In this way the Canadian taxpayer obtains a return on the investment in the research enterprise. While this role is a legitimate one for universities to play there is unease in the academic community that in order to obtain financing, universities are being forced into a process of turning their backs on fundamental studies, which are the foundation of future commercial applications, and being directed to respond to the dictates of the corporate world. The potential danger in this approach is

that, in the long run, both of these communities suffer. It is important, therefore, that care be taken to insure that the mandates of both partners are recognized.

At this point it is useful to indicate some of the successes achieved through partnerships between the academic and corporate sectors. A number of programs such as the Networks of Centres of Excellence (NCEs) have resulted in the development of spin-off companies and increased employment. The following are examples:

1. University of British Columbia | 23 companies | 732 employees
2. McGill University | 18 companies | 392 employees
3. University of Ottawa | 10 companies | 459 employees

RECOMMENDATIONS:

We encourage the federal government to pursue its stated aim to move Canada to the 5th position among the developed nations in research and development. This action will improve the research environment by providing the granting councils with sufficient funds to underwrite the creative talents of Canadian researchers.

Productivity in research and innovation depends on having the right people with the right training. We support expansion of training programs for post secondary education and strategies such as the Canada Research Chairs program for the retention of our active university-based researchers.

That for the health of the Canadian economy the federal and provincial governments cooperate to develop an effective policy regarding the funding of post secondary education to ensure that Canada has the personnel to respond to the innovation strategy.

We encourage the federal government to monitor the effects of university-corporate partnerships to ensure that a healthy balance is maintained between curiosity-driven and applied research.

Potential Solutions

In meetings with "decision makers" it is clear than most are aware of the problems outlined in this "brief". We have been persuaded, therefore, to bring forward solutions that will help resolve some of the challenges that face our Nation during the next decade. A number of suggestions are respectfully submitted with the belief that they may contribute to the thinking of those empowered to make change.

1. Allocation of Federal Funds to Granting Councils

The Federal Government's allocations to granting councils have, traditionally, been made on an annual basis, with the monies allotted having to be distributed before the end of a particular fiscal year. With this type of allocation formula carry-overs are not currently allowed. To provide flexibility to researchers who receive funds from the granting councils, and to reduce unnecessary "paper-work", research grants to individual researchers are normally awarded for 3-5 years. This means that in the situation when council budgets remain unchanged from one year to the next the only funds available for distribution come from turnover of terminating grants. The result is that, not only is there an unequal flow of funds to research applicants, but also that councils are impaired in their ability to develop new strategies and novel programs. *We would encourage the Federal Government to develop a mechanism that would incorporate a 3-year rolling average for allocations to granting councils.* This mechanism would not only permit a more even distribution

of funds to researchers but also permit a more effective use of the monies provided by the Federal Government.

2. "Indirect Costs of Research"

The research and university communities have greatly appreciated the Federal Government's recent move to support the "indirect costs of research". To insure that these funds are employed for the purpose designed and do not become a pretext to reduce provincial funding to post-secondary institutions we would encourage adoption of the following procedure. Every 3-5 years each eligible institution should be required to apply to the appropriate granting council for renewal of the "indirect costs". In this renewal application the institution should report how the funds previously awarded were used over the past 3-5 years in the support of research. In this way effective accountability should be expected. Assessments made by experts in the granting councils seem most appropriate since these individuals would be familiar with the research activities within the institutions. Finally, the granting councils already have in place the necessary infrastructure to administer and monitor the use of indirect costs.

3. Research By Canadian Corporations

One of the major challenges facing the Canadian Governments is how to increase the amount of research performed by Canadian corporations. To encourage greater involvement in investigative work the Federal Program Interchange Canada (sponsored by Treasury Board) promotes links between the federal government and organizations in the private sector. Given that more than 30% of the research in Canada is carried out in university laboratories we would encourage the extension of the Interchange Canada Program to reward industry when they establish research facilities on university campuses. In this way industry would benefit from the expertise of university personnel and provide the opportunity for industrial scientists to participate in faculty members' research program of interest to their company. Greater dialogue should then result between members of the academic and corporate communities. With Treasury Board as sponsor effective monitoring of the program could be expected.

4. The Next Generation of Scientists

With the rising costs of attending university and the increasing debt load following the undergraduate degree many bright students are delaying their entrance to graduate studies. Canada is in danger of not having sufficient numbers of individuals at the PhD level to promote the "innovation strategy". The allocations of the Federal Government should be geared to ensuring that the granting councils are able to offer graduate stipends and innovative training programs to attract our brightest students to careers as researchers. The level of support should be such that the graduate student will not incur massive debt and use up the prime of her/his life to obtain a career in science. To ensure that both undergraduate and graduate students receive training from the best qualified individuals strategies are required to enable many of our brightest minds to contribute to both research and training. The federal government can have a direct impact on the quality and productivity of our academic scientists by expanding the successful Canada Research Chairs program with a specific focus on professors that contribute to the education of both undergraduate and graduate students.