



Mining for gold: building a future

Dr. Bruce Sells, FRSC, Executive Director,
Canadian Federation of Biological Societies

For centuries, it was obvious that those countries with the greatest wealth and highest standard of living were often blessed with an environment that produced commodities in demand by the rest of the world. This was true whether the commodities were silks from the Far East, oil from the Middle East, or lumber and minerals from North America.

With advances in technology, man's ability to use commodities has changed. We have devised creative ways to develop industries that use these natural products. Countries that use new strategies most efficiently are in a position to ensure a better life for their citizens.

During the past century, the most advanced countries have recognized that, to compete in the global market place, a nation must not only identify new approaches but support research that can develop tools that, internationally, provide a competitive advantage.

Research and innovation

Canada has, for generations, relied on raw materials such as minerals, lumber, and wheat, to sustain our economic growth. During the last century, we have watched the gradual erosion of their contribution to the wealth of this country, with prices for some minerals at all-time lows. Gold is no longer the precious metal that it once was and we now have to recognize a new "gold standard". With rapid changes in technology, it is now clear that today's most sought-after commodity has become the creative mind.

In health research, inventive individuals have sequenced the human genome and identified the genes of specific human disorders. These accomplishments have opened the door to a wealth of opportunities for the treatment of previously incurable diseases. That we have arrived at this point is almost unbelievable to many scientists who started their research careers in the early 1950s, when DNA was barely accepted as "real" genetic material.

To achieve advancements that can conquer disease and to develop marketable approaches for these products requires that Canada support the process of innovation. To accomplish these goals, a research environment must not only insure an international level of financial support (i.e., one that matches the percentage of gross national product spent by the USA and members of the G-7 community) but also foster the education of undergraduate and graduate students with the highest degree of competence. These actions will permit Canada to achieve a maximum advantage in the realm of biological/biomedical research and to contribute to our physical and economic well-being.

Current research environment

Actions of the Federal Government over the past several years have demonstrated an awareness of the value of promoting the process of innovation. During that period, the Canadian Institutes for Health Research (CIHR), the Canadian Foundation for Innovation (CFI), and the Research Chairs Program (RCP) were created. In addition, increased funding was provided to extend the Network of Centres of Excellence, a program designed to help Canada realize the economic benefits of research done in Canada and to improve the financial situation of granting councils. These initiatives increased markedly both the morale of the scientific community and, at the same time, the quality of our nation's research environment.

While these improvements, which underpin the research capacity of our country, have been welcomed, we should remember that they were built on a system that was, financially, severely eroded. Serious issues must still be dealt with if we aspire to be seen as an "innovative nation". One major problem which confronts us is how to attract the scientists needed to fill positions that will be vacated in schools, universities, government laboratories, and industry during the next decade, when "baby-boomers" retire. Part of this issue is the current state of Canadian post-secondary institutions and their role in filling this need.

Our ability to sustain a creative society

"At precisely the time when the knowledge-based economy is crying out for better educated workers – people who can think and solve problems – we have seen a shocking decline in education spending".

This quote appeared in a speech by Charles Baillie, President of the Toronto Dominion Bank to the Canadian Club in Toronto on February 26, 2001. He went on to say that U.S. government spending has increased by 20% per student in public universities over the past two decades, while in Canada, government support has decreased by 30% during this same period. These statistics are not encouraging in a nation wishing to compete globally as a knowledge-based society. It is clear that quality education cannot be expected without adequate investment in libraries, undergraduate/graduate, laboratory facilities, and sufficient support personnel and faculty.

A factor that will complicate our ability to compete internationally relates to our capacity to satisfy our manpower requirements during the next decade. How will these needs be satisfied? Auditor General Denis Desautels has indicated that, during the first 10 years of this century, the federal public service expects between 7,000 to 9,000 employees per year to retire. They will have to be replaced. Currently 63 % of government jobs require a university degree, compared to 46% 20 years ago. During the intervening time, we have witnessed a 30% drop in university funding.

As more "baby-boomers" retire, we will need highly trained individuals to replace about 35,000 university faculty members who will leave the workforce. Demographics dictate that a large exodus of highly skilled scientists can be expected from industry during this same period, when

the need for these individuals will be even greater than it is now. Finally, a survey by the Canadian Federation of Independent Business 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 skills 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 future as a nation.

How will Canada obtain the human resources to satisfy its future needs?

Conditions in Canadian Universities

Two decades of erosion of support for post-secondary education has created an environment in most Canadian universities that has worked against the ability to realize our full potential as a nation. In undergraduate science programs, because of reduced operating budgets, funds are inadequate to provide a laboratory experience in courses where such opportunities were routine. This situation has occurred because of lack of funding to upgrade equipment and support technical staff. The sorry state of our libraries has further hindered the educational process for arts and science students alike.

A major expectation of university faculty members, in addition to teaching responsibilities, is to conduct research in their particular discipline. New federal initiatives have increased funding for this activity, with the expectation that universities will provide employees not only to manage these funds but also to ensure that adequate facilities are available. These costs, born by universities, place an additional burden on already strained operating budgets. To reduce this stress on university budgets, the scientific community has advocated that the federal government develop a mechanism to cover the indirect costs of research to compensate universities.

Because provincial grants for university teaching programs have failed to provide adequate support, these institutions have been forced to reduce the number of faculty members to diminish expenditures and generate the necessary income to cover operating costs. This financial pressure has led to increased responsibilities for the remaining faculty members, the elimination of courses for which no instructors are available, and the failure to initiate new courses that reflect advances in scientific knowledge. This situation has reduced the ability of Canadian universities to deliver what is expected of them under very difficult conditions.

Attracting new faculty members

Against this backdrop of conditions within Canada's institutions of higher learning, we have to consider recruiting a massive number of new faculty members to replace those who will retire. Furthermore, we are in a global competition for "brains". The support for higher education south of our border has been attractive to many of our most creative scientists. Given that U.S. requirements for new faculty members during the next decade will be similar to our own, how well are we going to compete?

With demands by government, industry, and off-shore institutions and corporations, Canada needs to make major readjustments if we are to be successful in educating and/or attracting those

individuals who will insure that the next generation of Canadian scientists are qualified to ensure that this Country functions competitively.

The need for individuals with postgraduate training, given the advances in technology, is accelerating. What are we doing to encourage our undergraduate students to consider further graduate training? The actions of most provincial governments have resulted in an environment that deters many students from considering this option. A progressive increase in tuition fees for undergraduate education has seen many students graduate with larger debts. The enormity of these debts dissuades many from further training at a time when more highly trained individuals are required. This downloading of university financial costs onto students to make up for the lack of operating funds from provincial coffers is a short-sighted strategy that undercuts our ability to attain our goal of an “innovative society”.

What are the conditions for effective recruitment?

A successful recruitment strategy requires two major components. One is an environment insuring scientists that they can depend upon consistent and adequate research support that allows them to be internationally competitive. While recent federal initiatives are laudable and have improved the research environment, other challenges still need to be addressed.

A continuing problem for CIHR and other granting councils (Natural Sciences and Engineering Research Council and Social Science and Humanities Research Council) concerns parliament’s financial allocation process, which provides budgets for one-year periods. Given the nature of research, granting councils normally provide awards spanning 3 to 5 years. Researchers applying for grants in years when no increase has been allocated by parliament are disadvantaged, since discretionary funds will only come from grant turnovers or discontinued programs. Greater effectiveness in forward planning would be possible if a 3-year rolling budget were instituted in which a predictable numbers of dollars were available for dispensation each year.

Creation of the CIHR was an excellent first step to ensure that investigative work occurs in all phases of health care. However, we need sufficient and on-going financial support to cover the broadened mandate of these new institutes.

In the past, Medical Research Council (MRC) research has been largely restricted to biomedical sciences. With the inception of the CIHR, the expectation was that many other facets of health-care research would be addressed. What we need now is the financial assurance that the CIHR’s new mandate can be realized.

It will be impossible for the CIHR to do justice to its mandate if the level of funding does not reflect its increased responsibilities. The current CIHR budget is \$500 million; the Minister of Health has accepted that this figure should be doubled. If we are to attract and retain the best brains in health research, this financial goal will have to be reached sooner rather than later, given that other nations are not standing still in their investments in health research.

The second important component relates to the education of the next generation of Canadian scientists. Much investigative work in this country, including the training of graduate students

and postdoctoral fellows, occurs in Canadian universities. The atmosphere within universities, over the past two decades, has become increasingly dismal. Working conditions have deteriorated, infrastructure for teaching programs has disintegrated, and students are unable to obtain the hands-on experience that used to be a normal occurrence. With faculty and support-staff downsizing, the ability of university scientists to be effective teachers and internationally competitive researchers has been seriously compromised. This situation has had two effects: to question whether we are doing justice to our students and country and to question whether we will be able to attract the very best academics to universities to educate our future scientists.

At this time, the opportunities for young scientists in this new century are changing. While most young PhDs used to aspire to academic positions, this is no longer the case. Many have observed the conditions within Canadian universities and decided that this option is no longer attractive. Some have left this country to enter faculty positions elsewhere or have entered industrial laboratories. Consequently, immediate attention is required if we wish to restore a vibrant university system.

Who is responsible for universities?

The Constitution of Canada provides the provinces with the responsibility for managing education for their citizens.

The federal government assists in the support of post-secondary education by the transfer of funds through Canadian Health and Social Transfers (CHST). Currently, no monitoring observes how this money is spent and how much flows to post-secondary institutions. No published report card has analyzed how the quality of our educational system has changed in the past 20 years, when universities have starved for operating funds.

There is no doubt that given the overall needs of the country, provinces have failed to take a leadership role in insuring that Canada has the capacity to equip itself with the best educated individuals needed for the challenges of this century.

How do we get ourselves out of this box? Clearly, the inaction of the provinces does not offer much hope that positive action is imminent for university operating budgets. What is also obvious is that federal transfers, through the CHST, will not be the vehicle for increasing university budgets. Currently, there is no assurance that these funds find their way into university coffers. New options are obviously needed.

Two options are available, but neither is a simple solution politically. Nevertheless, meaningful action needs to be initiated immediately to insure a flow of well trained/educated individuals:

1. A joint federal-provincial agreement aimed at supporting post-secondary institutions at levels that guarantee quality education for an advanced society. Action on this type of strategy is crucial. This agreement should improve funding and include provisions for a report card to Canadians to ensure that federal/provincial contributions are supporting post-secondary education. The legislation/agreement should require an impact statement of benefits.

2. In lieu of the above arrangement, a National University program should be considered. Recent polls by Decima Research Inc. (to determine whether Canadians believe that the federal government has a role to play in post-secondary education) have revealed that a large majority of our population favours such a role. A Quebec survey has produced similar results. Currently, at least two national institutions of higher learning, the Royal Military College and Athabasca University, exist in Canada. Given that so many areas of higher education are transferable across provincial and/or national boundaries, it is difficult to argue that provincial jurisdictions would be seriously threatened.

Summary

To provide the greatest opportunity for Canada to thrive in the evolving knowledge-based economy, federal and provincial governments must develop a partnership. It should be designed to assure Canadians that an environment exists to train, retain, and attract the best minds to allow us to compete internationally. The success of this strategy underpins the very future of our children and grandchildren. Currently, such a partnership is lacking, to the detriment of the whole Canadian enterprise. Many new federal initiatives have pointed us in the right direction, but in some ways, they resemble icing on a cake that lacks baking powder. There is great danger that “the whole thing will go flat”. Healthy post-secondary institutional support is a crucial ingredient. With a forward-looking research support system, it would permit this nation to move forward with confidence.