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**Securing our Future - A Renewal
Strategy for Post-Secondary
Research in Atlantic Canada**

Discussion Paper
August 2000

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PREFACE

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1.0 INTRODUCTION

1.1 The Environment

Knowledge and innovation are the keys to success in today's world. There is growing consensus that research is critical to sustaining socio-economic growth and quality of life. There is also increasing evidence that participation in the knowledge society is highly sensitive geographically. A strong regional capacity is needed to receive and build on knowledge generated elsewhere as well as within regional boundaries. It could be argued in fact that full participation in the knowledge society will be one of the most important "ties that bind" us as a nation for the future. As noted by Wolfe (1998, p. 17):

The geography of production in the new economy is marked by a "paradoxical" consequence of globalization—the role of knowledge and creativity places a premium on the kind of localized, or regionally-based innovation that is fostered by proximity. Innovative capabilities are frequently sustained through regional communities that share a common knowledge base and interact through common institutions.... Proximity to the source of research is critical in influencing the success with which new product innovations are adopted and diffused across developers and users.... Firms located close to major centres of academic research are deemed to have a "major advantage" over those located at a distance from the academic source of research.

The role of the post-secondary sector in a knowledge society is increasingly being emphasized. In its last university poll, Maclean's magazine noted that "for the first time in years, there is a strong consensus that universities are critical - perhaps pivotal - to the country's future success" (p. 51). Benefits of universities to a region include: providing an educated and skilled work force, attracting industry and investment, creating new opportunities to expand beyond our traditional economic base through knowledge transfer, providing expertise in all areas of social and economic policy, and contributing to the cultural and social fabric of the community.

Increased recognition of the importance of strong regional nodes of research capacity and the critical role of Canada's universities in developing this regional and national capacity has led to the rapid growth in recent years in new investment and collaborative opportunities. It is also clear, however, as noted in the Federal 2000 Budget, that access to these new opportunities is highly diverse across the country. In fact:

.... not all institutions of higher learning nor all regions of the country have the same capacity to exploit the opportunities that have been created. Efforts must be made to ensure that the Government's plan for innovation and skills can benefit Canadians in all regions. This point was made in the recently produced report "Catching Tomorrow's Wave," which identifies the many opportunities that are available to Atlantic Canada as it continues to develop new and unique technology-based initiatives. (Budget 2000, p. 7).

In this context, it is clear that Atlantic Canada has a strong base on which to build a vibrantly innovative and productive future. It is also clear however, as recognized in the federal budget, that Atlantic Canadian universities are among those that are not currently obtaining maximum—or even equivalent—benefits from new national opportunities for infrastructure modernization and information growth.

1.2 Purpose of Project

This project is intended as a starting point for addressing these issues and for the development of strong, collaborative strategies that will enable Atlantic Canada's post-secondary institutions – and hence all Atlantic Canadians - to participate fully in the benefits of current national reinvestment in post-secondary knowledge advancement and application. It is clear from the outset that these strategies must be rooted in Atlantic Canada. They must build upon current strengths and emerging opportunities, and generate a broad range of productive partnerships within the region and the country as a whole. In particular, they must strategically and collaboratively position Atlantic Canada to derive maximum benefits from the recently announced Atlantic Innovation Fund and related federal or private sector opportunities.

In 1999, a Research Project Steering Committee of Vice-Presidents, Research and other senior research administrators from the majority of Atlantic Canada's 17 degree-granting institutions came together to assess the current situation and to develop collaborative strategies. Initiatives included preparation of:

- (1) a background report on trends in post-secondary research in Atlantic Canada as compared with national and international trends (published in a separate document entitled *Report on Post-Secondary Research Trends in Atlantic Canada*);
- (2) a strategy document (this document) that provides highlights from the background report and, more importantly, summarizes the Steering Committee's strategies and proposals; and
- (3) an information package outlining the unique research niches and strategies of each participating post-secondary institution in Atlantic Canada (to be published in a separate document entitled *Post-Secondary Research in Atlantic Canada – Institutional Profiles*).

This project has only just begun. The Steering Committee will continue to meet together and with various stakeholders and beneficiaries. The target is to develop strong partnerships and a clear track to results within this fiscal year.

2.0 REPORT HIGHLIGHTS - “WHERE HAVE WE BEEN?”

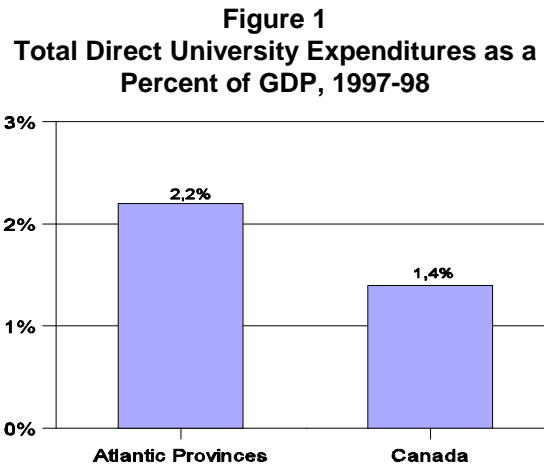
In reviewing historical patterns affecting Atlantic Canada's post-secondary research investments and outcomes, the Research Committee identified a number of key conclusions or “messages” to guide them in developing strategies for the future. These messages are as follows:

Atlantic Canada's post-secondary institutions provide a strong “niche” base for an innovative future

- ? **9.5% of Canadian students**
- ? **recognized academic excellence**
- ? **strong research base in key areas**
- ? **sources of knowledge and innovation**
- ? **demonstrable cross-sectoral benefits**

The Atlantic provinces have always been important contributors in the Canadian higher education landscape. Indeed, the region's post-secondary institutions rank consistently high in national comparisons. Atlantic Canada represents only 7.8 percent of the Canadian population. Yet, in terms of higher education, Atlantic Canada's universities have 12 percent of the nation's faculty and educate 9.5 percent of

Canada's university students, including 6.2 percent of the nation's graduate students. Atlantic Canada's universities also play a key role in the region's economy, representing 2.2 percent of the region's GDP compared to a Canadian average of 1.4 percent (see Figure 1).



Source: APEC and AAU. 2000. Our University Students: The Key to Atlantic Canada's Future. p. 11.

Over the years, Atlantic Canadian institutions have developed internationally recognized expertise in the resource sector, including forestry, aquaculture, ocean technology, and environmental science. They have developed strong niches of expertise in the knowledge sector, including geomatics, medical devices and services and computer science. The region is also a major contributor in the area of social sciences and humanities.

Annex A highlights some of the recent post secondary research success stories from across Atlantic Canada. These success stories are part of a new exercise to determine more clearly and publicize the benefits and outcomes of post-secondary research across a broad range of socio-economic and cultural sectors.

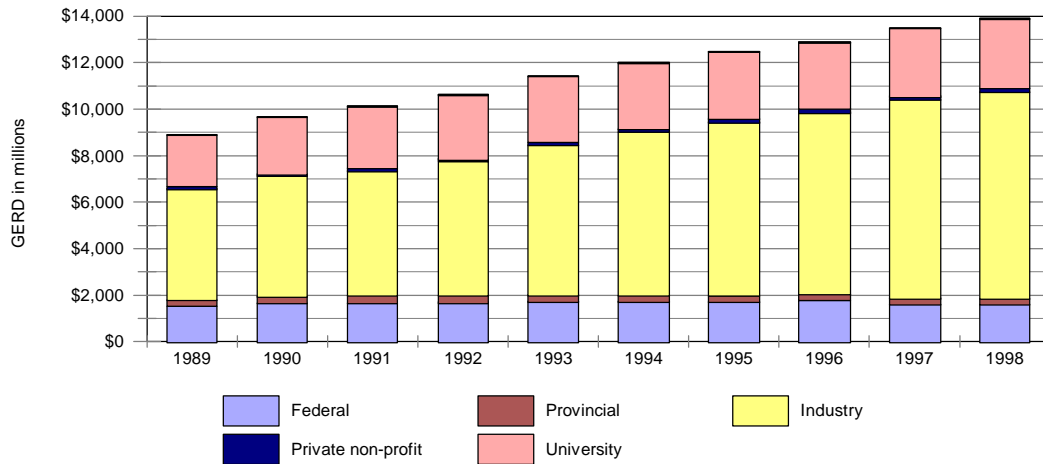
National investment in post-secondary research is accelerating rapidly

- ? **growth in industry investment**
- ? **substantial new federal programmes**
- ? **higher non-Atlantic provincial support**

Over the past few years, Canada has witnessed an unprecedented surge in post-secondary research reinvestment involving all sectors, including federal and provincial governments as well as the private and non-profit sector. Between 1989 and 1998 expenditures on R&D have increased by 56 percent (see Figure 2). This growth is expected to continue given that each federal budget since 1998 has brought new

initiatives involving major financial investments. These include: the Canada Foundation for Innovation, the new Canadian Institutes of Health Research and the Canada Research Chairs initiative as well as significant increases to granting council budgets.

Figure 2
Expenditures on R&D by Performing Sector Canada, 1989 to 1998



Source: Statistics Canada - GERD, Canada, 1987 to 1998 and by Province 1987 to 1996

Much of Canada’s growth in R&D has resulted from increased activity by the industry sector followed closely by the private non-profit sector. Universities have also increased their R&D activities but to a lesser extent. Meanwhile, R&D activities by the provincial governments have decreased slightly while R&D activities by the federal government increased slightly over this same time period. Data is not yet available from Statistics Canada for more recent years (1998-2000), however, these can be expected to reflect recent, major increases in new federal and provincial programming primarily in non-Atlantic provinces such as Alberta, Quebec and Ontario.

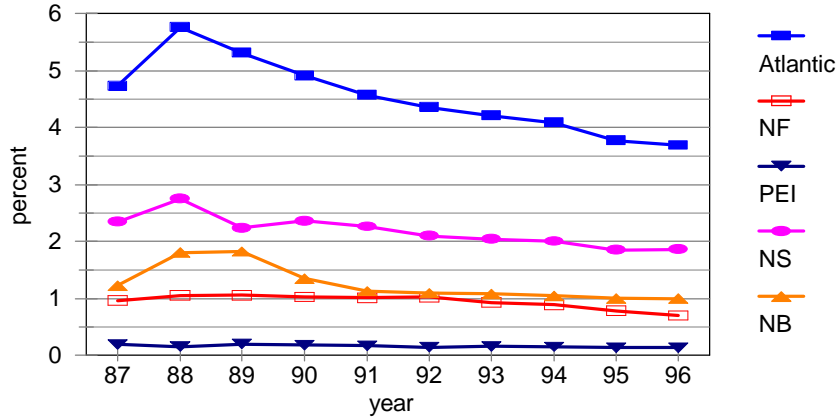
Atlantic Canada is not yet participating as extensively as it should in this resurgence

- ? expenditures stagnant
- ? limited provincial investment capacity
- ? limited small-to-medium enterprise capacity

Report findings (as detailed in the separate document entitled *Report on Post-Secondary Research Trends in Atlantic Canada*) indicate quite clearly that Atlantic Canada is not yet participating as extensively as it should in this national resurgence in R&D investment. While overall expenditures on R&D have increased over the past ten years in Canada, R&D expenditures across Atlantic Canada have remained stagnant from 1989 to 1996 at about

\$440 million. Meanwhile, Atlantic Canada’s percentage of national expenditures on R&D has been steadily declining from 1989 to 1996 (see Figure 3). Again, because of recent surges in provincial investments outside Atlantic Canada, data for subsequent years (1998-2000) (not yet available from Statistics Canada) is likely to show an even further decline for this part of the country.

**Figure 3
Atlantic Share by Province of National R&D
Expenditures, 1987 to 1996**



Source: Statistics Canada - GERD, Canada, 1987 to 1998 and by Province 1987 to 1996

The reasons for Atlantic Canada’s slippage in the overall national context are complex. They include significantly lower participation of industry and non-governmental sectors participation of various sectors in post-secondary research in Atlantic Canada and differences in research infrastructure support. They also include design issues involving federal programmes that inadvertently make it more difficult for smaller institutions to participate.

Full Atlantic participation in this national resurgence requires:

- ? **substantial increases in investment**
- ? **competitive researcher recruitment**
- ? **competitive research infrastructure**

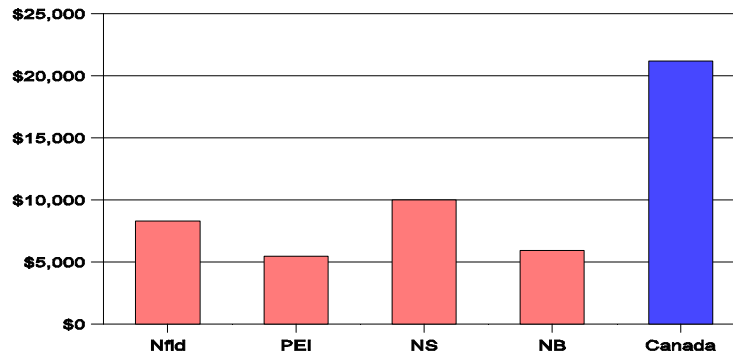
Investment challenges

In Atlantic Canada, the primary source of research funding is the federal government and not industry as is the case in Canada as a whole. Between 1989 and 1995, industry increased its level of R&D funding in Canada by 47 percent. Meanwhile, in Atlantic Canada funding from industry increased by only 2 percent over this

same time period. The problem is further exacerbated by the fact that Atlantic Canada is primarily made up small to medium enterprises and therefore has more difficulty accessing funding from industry than the larger provinces.

Nationally, funding from the federal government increased by 5 percent between 1989 and 1995; whereas in Atlantic Canada, funding from the federal government decreased by 5 percent during this same time period. This represents, for the region, a 10 point deficit in six years. Atlantic Canada is much more dependent on funding from the federal government than Canada as a whole so that a decrease in federal funding has a far wider impact in this region than in the other regions. When expressed per full-time faculty, federal funding to universities in Atlantic Canada has been among the lowest in the country (see Figure 4).

Figure 4
Federal R&D Funding to Universities per Full-Time Faculty Member, 1995-96



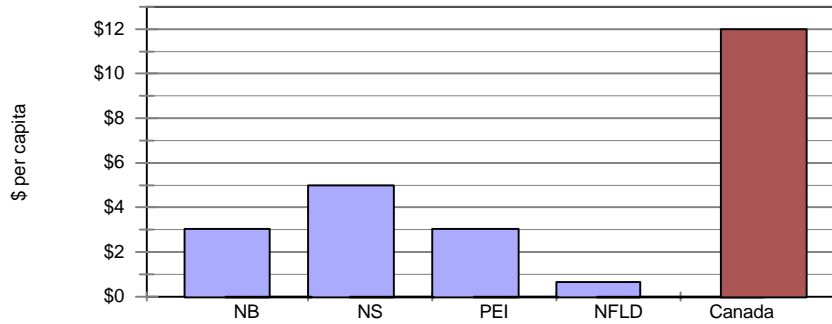
Source: AAU, Atlantic Canada - A Knowledge-Economy Drop-out? Presentation to the Federal Liberal Caucus, 1999, p. 10, based on MPHEC/Statistics Canada

Funding from the federal government includes funding from the three granting councils [the Social Sciences and Humanities Research Council (SSHRC), the Natural Sciences and Engineering Research Council (NSERC), and the Medical Research Council (MRC)] which represent important sources of R&D funding to universities throughout Canada. When granting council revenues are expressed per full-time faculty, it is clear that Atlantic Canada has consistently received less than the national average. Between 1993-94 and 1997-98, Atlantic universities received on average 6.5 percent of total NSERC revenues, 5 percent of total SSHRC revenues and 2.7 percent of total MRC revenues to all universities in Canada. The reasons for this situation are complex and involve institutional and regional factors as well as programme design and governance issues.

In Atlantic Canada, the provincial governments' capacity to support research has always been more limited than in other provinces for fiscal and other reasons (see Figure 5). In fact, the Atlantic provinces (with the partial exclusion of Nova Scotia) are the only ones in the country without special post-secondary research matching initiatives. Continuing fiscal restrictions in Atlantic Canada make it highly unlikely that these provinces can even begin to match the most recent injections of new dollars by provinces like Alberta, Ontario, British Columbia and Québec. Alberta recently created a \$500 million envelope to fund engineering and information technology research in addition to its billion dollar health research foundation. Ontario is investing hundreds of millions of dollars on universities including incentives for investment in key areas of the knowledge economy. In British Columbia, the government is creating a fund to match dollar for dollar what universities privately fundraise. In Québec, the provincial government through strategic policies has effectively linked universities with private labs, notably the pharmaceutical industry.

In this context, it should be noted that the recently announced Atlantic Innovation Fund (terms and conditions yet to be determined) will present opportunities to address these imbalances in capacity to benefit from and leverage natural opportunities.

Figure 5
Provincial Contributions to University sponsored Research 1997-98 - \$ per capita



Source: Canadian Association of University Business Officers (CAUBO)

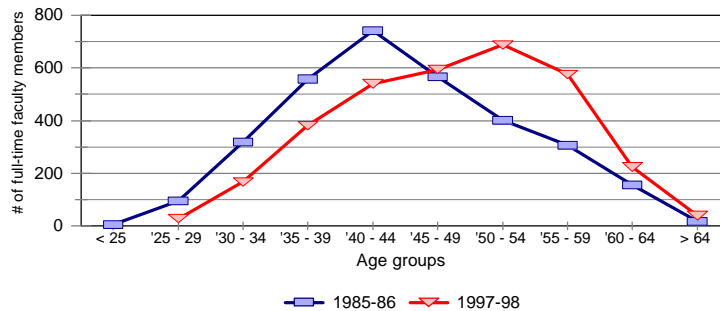
“People” (recruitment and retention) challenges

“Talent is the primary strategic resource for innovation” (Munroe-Blum, H., Duderstadt, J. and Davies, G. 1999, p. 3). Indeed, the development of a strong regional and national “pool” of talent is the primary role of Canada’s universities. This development in turn presupposes a high level of faculty commitment and talent.

Traditionally, Atlantic Canada has relied on relatively limited national competition and “soft” factors such as quality of life to attract and retain high calibre faculty. Various graduate follow-up surveys have shown that graduates from Atlantic Canada generally have a strong tendency to remain in Atlantic Canada, all things being equal. Ideally, these young graduates should be able to find opportunities for employment in Atlantic Canada as large numbers of current faculty members begin to retire (see Figure 6). In this context, there are questions as to whether Atlantic Canada has an appropriate range of accessible graduate programmes in the region.

Figure 6
Age Demographics of Full-Time Faculty at Maritime* Universities

*Newfoundland data not available



Source: University and College Academic Staff Survey (UCASS)

However, all things may not be equal. Universities across Canada and in the United States are facing major faculty shortages. These universities are often better placed to compete on any number of levels including salary, equipment, release time for research and so on. This factor will place increasing strain on Atlantic Canada's university faculty capacity in the coming years and will require strategic regional recruitment efforts.

Research infrastructure support challenges

A key ingredient in strengthening Atlantic Canada's R&D capacity is an environment which is conducive to research and supports researchers. Indeed, a strong supportive research environment is critical, acting as a kind of "glue" that holds all the other pieces together. It is made up of a broad range of elements, some of which are not as easily quantifiable as investment dollars. This environment includes access to advanced equipment equivalent to that available to other researchers elsewhere, opportunities to participate in national programme design and peer review processes, and university support ranging from time allowances for research to mentoring, proposal development and commercialization support.

The announcement in the 1997 budget of the establishment of the Canada Foundation for Innovation (CFI) was a key measure in renewing the research infrastructure of Canadian universities. Its purpose is to provide funding for the modernization of research infrastructure at Canadian post-secondary institutions and research hospitals in the areas of health, environment, science and engineering. It is designed as a matching fund scheme, with contributions from the Foundation limited to 40 percent of the total cost of infrastructure projects. As of February 2000, Atlantic Canada had received 4.5 percent of total CFI funds which represents significant infusions of new capital to the region. Nevertheless, this amount is low given the fact that the region employs 12 percent of the nation's faculty. One reason is that the University Research Development Fund (which includes all Atlantic universities except Dalhousie and Memorial universities) allocations were set according to a formula based on previous granting council successes. This meant that Atlantic universities were limited in Round One by a historical cap. Another reason, which is more critical for subsequent competitions, is the absence of provincial "matching" initiatives. The latter has undoubtedly the most significant barrier facing Atlantic Canadian universities in accessing major new initiatives like the Canada Foundation for Innovation.

Atlantic Canada's post-secondary institutions are committed to achieving full participation

- ? **new collaborative fora**
- ? **research profiles & strategies**
- ? **outcomes definition/information**
- ? **improved stakeholder linkages**
- ? **improved access to federal infrastructure initiatives**

As noted earlier, this project is not an end in itself. It is intended only as the starting point for collaborative strategies involving all major Atlantic Canadian stakeholders and federal partners. These strategies begin in the Atlantic provinces with a clearer and more collaborative focus to be driven by the Post-secondary Education Research Committee comprising Vice-Presidents and Senior Researchers for Atlantic Canadian Universities (formerly the Research Project Steering Committee).

Following issuance of these initial "baseline" reports, the Committee intends to proceed with further work on "outcomes linkages," mapping of strategic areas for cross-institution collaboration and

measures to improve intelligence about opportunities, federal programme requirements and researcher support. Five broad strategies, as outlined below, have been developed to anchor this future work with the ultimate goal of achieving full participation by Atlantic Canada in the national resurgence in post-secondary research reinvestment and results. Target dates have been set at five years. In this context, efforts will be concentrated in deriving maximum benefits from the recently-announced federal Atlantic Innovation Fund.

3.0 OBJECTIVES AND STRATEGIES – “WHERE ARE WE GOING?”

More strategic role in regional knowledge development and applications that builds on major niches & opportunities

Atlantic Canada’s post-secondary institutions have broad responsibilities covering a number of disciplines. As noted above, their primary and most vital role is to prepare young Canadians for life in a knowledge society –to connect youth and innovation. In so doing, they have to sustain accessibility for a diverse and bilingual regional

population. A high calibre of institutional scholarship and innovation is needed to achieve this primary role effectively. It is critical to sustaining regional connections to knowledge and innovation across all social, economic and cultural sectors.

In this context, it is clear the Atlantic provinces do not have the population base or resources to “be all things to all people” –particularly insofar as research is concerned. They need to focus strategically on niche strengths and opportunities - without discouraging the kind of independent curiosity that more often than not leads to new directions and societal benefits. This strategic effort is well underway; however, momentum needs to be increased so as to maximize national and international investment support and networking opportunities.

Many post-secondary institutions in Atlantic Canada, particularly those that have been involved in the Canada Foundation for Innovation competitions, have already begun to develop Strategic Research Plans. The stimulus to prepare such plans was one of the major benefits of the CFI competition. Further work will be required in order to strategically orient hiring of new staff - particularly in response to the new Canada Research Chairs initiative and the recently-announced Atlantic Innovation Fund.

The wide range of mandates and research strengths among Atlantic universities makes this exercise one that has to be done first on the institutional level. There is an additional commitment on the part of the Research Committee to look actively for areas that can be strengthened through inter-institutional collaboration. Work is also planned on identifying linkages to priorities established by regional governments and other potential partners and on improving communication with partners.

Increased stakeholder awareness and buy-in focussed on outcomes and partnerships

There is also a need for increased public and political awareness of the broad range of benefits from university-based research. This includes increased national awareness of the importance of strong geographic research nodes across the country as well as a regional understanding that support for research is not

just the responsibility of Ministries of education. The link between post-secondary research and sectoral priorities and outcomes needs to be much more explicit.

In this context, there is a need –also recognized at the national level – for a clearer understanding of the linkages between post-secondary research investment and positive socio-economic and cultural outcomes in Canadian society. Work is currently underway on this issue at the national level under the sponsorship of the Council of Ministers of Education Canada and also by Statistics Canada. Some of the traditional outcomes measures, such as bibliometrics, spin-off company and patent statistics, are useful but clearly do not go far enough. Of greater interest in the broader society are potential impacts on agricultural yields, durability of transportation materials, multi-media and high-tech innovation, increased effectiveness of health and social services, more arts and culture innovations and so on, to give only a few examples.

In addition to regional participation in national initiatives, the Research Committee has decided, with the support of the Maritime Provinces Higher Education Commission and the Atlantic Canada Opportunities Agency, to do further research into improving our knowledge of research outcomes and their concrete applications in the broader society. Initiatives are also being put in place to explore linkages between Atlantic university research “niches” and priorities identified by a broad range of provincial departments, e.g. linkages to the environment, tourism, investment attraction, health and social policy and services, etc.

Implementation of proposals as the basis for provincial research envelopes “matching” federal/private fund-raising in Atlantic context.

One of the barriers to the full utilization of post-secondary research benefits is the fairly widespread perception that this research is “isolated,” and directed to scholarly journals. The result is that strategic involvement and investment has tended (with some exceptions) to be perceived as primarily the role of Ministries of

Education. The targeted structures and funding mechanisms of government organizations tend to reinforce this assumption.

The Research Committee recognizes that each provincial, non-education department needs to be actively involved in setting priorities, making choices and reaping the benefits for this broader and deeper investment to occur. Not enough work has been done on the link between post-secondary research capacity and facilities and the attraction of knowledge based investors (e.g. new companies needing access to a highly-educated workforce and/or research facilities to give only one example).

It is proposed that discussions take place with each provincial government concerning the creation of special provincial research envelopes derived from contributions from each of a broad range of departments. Processes will also need to be developed to strategically manage investments from this envelope and to use these envelopes as levers for additional federal or private sector investment including the new Atlantic Innovation Fund. Grids and processes could be modelled on those used by the Canada Foundation for Innovation; in the Committee’s view, however, it is very important that investments include social and cultural as well as economic priorities. One condition for investment could, for example, be the existence of cross-institution, private sector, non-governmental, community, government department or other partnerships to access these “envelopes”. Accountability measures would also have to be identified.

In this context, it should be noted that there is a major gap in provincial investment both nationally and across the Atlantic provinces. A minimum target for achievement, according to the Research Committee, would be to meet or exceed the national average (\$12 per capita as of 1997) in five years.

The national average can be expected to continue to rise particularly if the “lower” Atlantic provinces begin to catch up and the other provinces continue to increase their investment, as is likely. It should also be recognized that there are significant differences in the current level of contributions of the individual Atlantic provinces with Nova Scotia closer to the national average and Newfoundland in last place. Finally, the Research Committee recognizes the impossibility of getting this amount out of post-secondary budgets alone. From a broader perspective, however, the amount seems more achievable if such an envelope were to be created from a percentage of the total funding allocated to each department or agency that would benefit from research done by universities.

Increased federal investment in Atlantic Canada that will bring this region to the national average within the next five years

The Atlantic Provinces are far more reliant on federal support for innovation than other regions which have a stronger corporate and non-profit presence. If anything Atlantic access to and use of federal support would have to be higher than in many of the central Canadian provinces simply to offset (and build) a relatively much-lower corporate and non-profit presence.

As noted in the historical report on “Trends,” post-secondary institutions in Atlantic Canada have tended to receive proportionately more assistance from non-granting council federal institutions than from federal institutions. This may be in part due to the natural resource focus of much of Atlantic Canada’s economy and research. This situation has unfortunately had a negative impact, along with other design factors, on Atlantic Canada’s access to federal programmes (such as the Canada Foundation for Innovation and the Canada Research Chairs initiative) that are based in part on granting council success rates. Another major drawback has been the difficulty in obtaining the required matching funds, given the absence of provincial matching grants available elsewhere in Canada.

This suggests that early consideration should be given to the impact of proposed terms and conditions of federal initiatives on Atlantic Canada. A case in point is the recent high level of involvement of Atlantic Canadians in the revision of the Research Chair allocation quotas which will hopefully, as a result, provide more appropriate opportunities in this part of the country.

Accessible terms and conditions (granting council and other federal programmes) are not in themselves enough however. The Committee noted a need for regional development or other special funding mechanisms to stimulate private sector investment capacity and to offset the lack of availability in Atlantic Canada of matching funds available in other provinces. Complementary design provisions and matching opportunities are critical to the success of Atlantic Canada’s own efforts to build strategically on regional strengths, opportunities, and needs. In this context, the announcement of a new Atlantic Innovation Fund presents a major and greatly appreciated opportunity that would support the collaborative work envisaged by the newly-created Council of Atlantic Premiers. This initiative is a component of the new Atlantic Investment Partnership and represents a new \$300 million initiative to invest in Atlantic Canada’s technology and research infrastructures, particularly post-

secondary institutions and other research institutions, in order to strengthen the region's research capacity and increase the capability to develop and commercialize new technologies. In this context, the ability of the Research Committee to lead and strengthen research collaboration and partnerships is critical.

Nationally competitive researcher and infrastructure support

The multiplicity of small institutions in Atlantic Canada presents additional challenges when it comes to developing strong networks and a critical mass of interdisciplinary links. Cross-institutional collaboration is a "must" in this context. A second challenge involves better and more timely access to information about federal, provincial and non-governmental opportunities. More often than not, central Canadian provinces have learned about and influenced the design of a new federal initiative before Atlantic universities have any idea about this opportunity. There are also international opportunities that need to be identified where these are relevant to Atlantic priorities. Conversely, universities in Atlantic Canada need better information on just what kind of information is needed for successful competition – how to improve their success rates and outcomes. Finally, the indirect costs of research need to be addressed as these fall disproportionately on the operating budgets of universities.

The Research Committee is therefore committed over the next fiscal year to developing collaborative ways, where these are appropriate, to address these challenges. Collaboration could, for example, include development of joint approaches to such issues as commercialization and researcher support. This may be particularly critical for the smaller, primarily undergraduate institutions.

4.0 CONCLUSION

Participation in Canada's emerging knowledge society is rapidly becoming one of the most important "ties that bind" us together as a nation. That participation is key to sustaining a strong economy and our international first place in terms of quality of life. This new knowledge society must be inclusive both regionally and sectorally.

This report demonstrates that Atlantic Canada has not yet participated fully in national and international research reinvestment. The reasons are complex but not irreversible. Atlantic Canada's universities recognize that they themselves must take the first steps. They are committed to working on niche strategies and regional networks that will support achievement of the socio-economic priorities of the various Atlantic Canadian provinces and the region as a whole –without, as noted above, discouraging the kind of independent curiosity that more often than not leads to innovation and societal benefits.

At the same time, it is clear that Atlantic Canada –as part of the broader Canadian knowledge society – cannot go it alone. This report is only the beginning. Atlantic Canadian universities are committed to working with governments and industry to capitalize on the talents of Atlantic Canadians and to secure the region's future within the national R&D agenda.

Annex A

Atlantic Canadian Post-Secondary Research Success Stories

- ? *Acadia University:* Since 1977 Sandra Barr, a geologist at Acadia University, has researched igneous rocks in Nova Scotia and New Brunswick, focussing on their distribution, age, potential for hosting economic mineral deposits and their role in the geological history of the northern Appalachian mountain belt. Her work is internationally renowned. She has provided students with valuable research opportunities and has attracted over \$550,000 in research funds to the region.

- ? *Dalhousie University:* In November, 1996, Dr. Rengaswami Rajaraman, a member of the Dalhousie Faculty of Medicine, coined the term 'Endoapoptosis' to describe a unique cellular mechanism which he discovered relating to the ability of cancer cells to survive genetic damage. Following disclosure of the technology to the University through its technology transfer office, NU-TECH, a USA patent application was quickly prepared and filed within two weeks, in December, 1996. The filing was immediately prior to public disclosure of the technology at a scientific conference in California, even though the full commercial potential of this exciting discovery could not be fully ascertained. The start-up company, OncoDynamics, was incorporated in January 1999 to pursue identification of genes and gene products associated with this biological discovery. A follow-up investment was made in the company in December 1999, and the first USA patent on the technology is expected to be issued later this year.

- ? *Dalhousie University:* A professor in Civil Engineering and his graduate student at Dalhousie University have discovered a new synthetic fibre to be used in producing stronger concrete. The technology has been patented world-wide and will result in production jobs in Cape Breton, employment opportunities for civil engineering graduates, an ongoing major research programme in Dalhousie's Faculty of Engineering, additional facilities and equipment for other researchers, and income for the inventors, the University, and two Nova Scotia based companies and their employees.

- ? *Memorial University:* C-CORE, an engineering research institute located at Memorial University, educates and trains engineers and scientists to work offshore and in technology-based industries. Funded by industry and government, the centre undertakes research contributing to the safe economic development and utilization of Canada's ocean-related resources and has been the source of a number of spin-off companies in the high-tech sector.

- ? *Memorial University:* Memorial University has been the driving force in the development of the aquaculture industry in Newfoundland. As a result of basic research and other university initiatives, there are today viable aquaculture operations where previously there were none. Recent investments by both levels of government, Memorial University and the Canada Foundation for Innovation have enabled the opening of a state-of-the-art aquaculture research building at Memorial's Ocean Sciences Centre. These facilities and expertise had allowed Memorial to lead one of the new Networks of Centres of Excellence, called AquaNet. AquaNet, funded at \$14.6 M over 4 years for the NCE programme plus additional cash and in-kind contributions from partners of about \$11 M will unite researchers in basic and applied science of fish technology, environmental and socioeconomic aspects of this industry across the country.

- ? *Memorial University:* Recommendations to governments on day care legislation resulted from the Atlantic Day Care Study carried out by Drs. Mary Lyon of Mount Saint Vincent's University and Dr. Patricia Canning of Memorial University. The study explored the relationships between among the social policy context of day care, characteristics of centres, quality of care, family background and child development.
- ? *Mount Allison University:* Dr. Hawkes at Mount Allison is the world expert in the application of video technology to meteor observations. He was recently in Israel oversee a mission to provide data in real-time to help satellite operators respond appropriately to the potential threat caused by Leonid showers.
- ? *Mount Saint Vincent University:* Dr. Blye Frank in the Department of Education at Mount Saint Vincent University was asked by the Halifax Regional School Board to conduct an external review of Cole Harbour High School, a high school that had been reported as experiencing racial tensions over the last number of years. He conducted a broad-based comprehensive and participatory review, employing a variety of data collection techniques, 109 confidential interviews, 12 focus groups, 14 on-site visits as well as a wide review of school documents and records. The 51 page report contained 73 recommendations, most of which have been implemented at the school and school board level and have had a significant impact on the daily functioning of the school, as well as on policy development. In fact, over the last 36 months, Cole Harbour District High School has been experiencing success in maintaining a well-functioning peaceful environment.
- *Nova Scotia Agricultural College:* Protein "finger-printing" technology developed by Nova Scotia Agricultural College (NSAC) professors Robin Robinson and Glenn Stratton as a forensic technique to identify illegally possessed game has proven useful in ensuring the quality of ground meat sold in grocery stores. After receiving evidence of adulteration of ground beef with pork or poultry in 1996, retail grocery chains contracted the Protein Biochemistry Research Lab at the NSAC and Quality Assurance Branch at the Nova Scotia Department of Agriculture and Marketing to monitor the quality of ground meat. As a result of this process, the incidence of adulteration of ground beef in Nova Scotia is now less than one percent. The technology has also proven useful in identifying the origins of both fin fish and shell fish, whether naturally or commercially raised.
- *Nova Scotia Agricultural College:* Dr. Rob Gordon, Associate Professor of Agricultural Engineering at the Nova Scotia Agricultural College, has found through his research into constructed wetlands that they represent an effective system for treating nutrient-rich waste water from farm manure, milk houses and other sources. In addition to raising the quality of the water to meet environmental standards, these systems also provide new habitat for wildlife such as waterfowl. These systems are expected to be useful to farmers in meeting new environmental regulations coming into effect in Nova Scotia and elsewhere.

- *Nova Scotia College of Art and Design:* Dr. Nick Webb in the Division of Art Education at the Nova Scotia College of Art and Design has recently completed a research project that examines tourism as a ground for making decisions regarding the way communities appear visually.
- *Nova Scotia College of Art and Design:* Researchers in Environmental Planning at the Nova Scotia College of Art and Design have been active in a variety of projects. For example, Dr. Patricia Manuel has been studying the ecological, cultural, and aesthetic values of small wetlands in urban settings. A technique is now under development that will allow planners and developers to interpret these environments so that they can be more successfully integrated into built environments. Dr. Jill Grant, with colleagues at Dalhousie University, is considering strategies for reducing greenhouse gas emissions at the Debert Air Industrial Park.
- *Saint Mary's University:* The research expertise of Dr Doug Strongman of Saint Mary's University on carrion insect larvae has been used by the RCMP in homicide investigations and by wildlife conservation officers investigating poaching.
- *Saint Mary's University:* Dr Zhongmin Dong at Saint Mary's University has developed a method to inoculate rice plants with a nitrogen fixing bacterium isolated from sugarcane. This research has resulted in increased yields of 10-30%. He is currently trying to extend this technique to the principal cereal crops.
- *St. Francis Xavier University:* St. Francis Xavier University's 2000 University Research Award recipient is the distinguished biblical archaeologist, Dr. Burton MacDonald. For more than 30 years Dr. MacDonald has conducted field work in the Near East, especially in the Kingdom of Jordan. The quality and scope of his work put him in the first rank of Near Eastern archaeologists. He is also the author or co-author of five books and over 30 scholarly monographs. Dr. MacDonald's research has received sustained support from external granting agencies, including the Social Sciences and Humanities Research Council of Canada, the American Schools of Oriental Research, and the Kyle-Kyle Foundation. Burton MacDonald has also given exemplary support over the years to the younger generation of archaeologists, many of whom he trains on site.
- ? *St. Francis Xavier University:* St. Francis Xavier University's Biology Department and Interdisciplinary Studies in Aquatic Sciences (ISAR) program are supported by basic research strengths in aquatic biology. Dr. Bill Marshall, who has a strong record of major research funding from NSERC, is a fish physiologist interested in regulation of ion transport in killifish and is examining how euryhaline fish up- and down regulate the now famous anion channel "Cystic Fibrosis Transmembrane Conductance Regulator". Although mutations of the channel produce CF in humans, in fish its regulation is pivotal to their ability to move into seawater and hence is important to smolting of salmon, shad and Gaspereaux.
- ? *St. Thomas University:* The Centre for Research on Youth at Risk at St. Thomas University is an interdisciplinary research center including faculty members from universities in all parts of the country holding positions as research fellows. The Centre also partners with a wide range of community organizations. Current projects include research on high-school dropout rates, adolescent eating disorders, street youth, youth violence, youth illiteracy, substance abuse, youth and sexually-transmitted diseases.

- ? *Université de Moncton:* The Research Group on Thin Films and Photonics (GCMP) has developed several optical metrology instruments (multiple-angle photoellipsometry, spectrophotometry) used to measure the optical properties and thicknesses of thin films. These instruments are particularly important in the semiconductor industry and the surface coating industry. Recently, in cooperation with the company Com Dev, the GCMP conducted an experiment in microgravity conditions (in the space shuttle) with the help of a device involving seven ampoules of organic thin film preparation. The experiment established the advantages offered by microgravity in relation to the formation of microstructures promoting specific applications of the films obtained. In general, the activities of the GCMP contribute to the establishment of an environment favourable to the high-tech industry in New Brunswick.
- ? *Université de Moncton:* The research projects of the K.C. Irving Chair on Sustainable Development take in several themes important to the province and the Maritime region. First, studies on model forests identify guidelines for the management of snags. Another example of the Chair's work concerns the development of an economic management plan for Bouctouche Bay's natural resources. This project is in keeping with the concept of sustainable development and model oceans. These two research thrusts show the significant socioeconomic impact of R & D studies. Not only will the research results make it possible for local resource operations to be carried out in a manner favourable to conservation, but the economic spinoffs for the region are already very evident.
- ? *Université Sainte-Anne:* Research at the Université Ste. Anne provides insights into the cultural impacts of new communications technology on French-language minorities. In addition, assessments of French-language ability of Nova Scotia Acadian school children provides a basis for improved minority-language cultural and educational programming.
- ? *University College of Cape Breton:* The development of the Grade 6 Children's Rights Curriculum (CRC) by Dr. Katherine Covell and Dr. Brian Howe at the University College of Cape Breton has resulted in the curriculum being implemented in several schools throughout Nova Scotia. Subsequently, the CRC is to be used in other provinces with Nova Scotia as a model. The curriculum is based on findings which indicate that when children learn about their rights, they show increased support for the rights of all persons and for rights-related values.
- ? *University of New Brunswick:* Dr. Nancy Mathis, a doctoral graduate of the University of New Brunswick, invented the TC Probe, named one of the most important technological innovations in 1999, that is attracting interest by such companies as IBM, Maytag, Proctor and Gamble and Whirlpool. The TC Probe measures thermal conductivity and has the capacity to prevent fires in computers, cars, homes and aeroplanes. In addition she co-founded a high-tech company in Fredericton with a complement of engineers, technicians and scientists on staff.
- ? *University of New Brunswick:* Dr. Pearl Sullivan, a researcher in the University of New Brunswick's Department of Mechanical Engineering, is developing distributed fibre-optic smart structures for aerospace application. It is the only known fibre-optic sensing capability in the world today for both temperature and strain, along a single fibre. Dr. Sullivan will work with users at the Institute of Aerospace Research at the National Research Council of Canada in Ottawa. She will also work with three other researchers at the university. Aerospace is one of Canada's

leading advanced-technology sectors. The technology transfer to local industries resulting from the research of the team led by Dr. Sullivan is expected to contribute not only to the expansion of the aerospace sector but also to economic growth in Atlantic Canada.

- ? *University of Prince Edward Island:* PEI produces some of the highest health status swine breeding stock available in North America. The continent wide spread of the Porcine Respiratory and Reproductive Syndrome (PRRS) virus during the 1980's and 90's posed a threat to this breeding programme. Researchers at the Atlantic Veterinary College developed a rapid diagnostic test to detect the PRRS virus in swine semen and make that test available to the swine industry. This has enabled the industry to import genetic material (semen) without fear of introducing PRRS into the breeding herds and hence has maintained PEI's enviable position as a supplier of high health status breeding stock.

- ? *University of Prince Edward Island:* In 1987 domoic acid in cultured mussels produced in PEI estuaries was responsible for the deaths of four people across Canada. Researchers in both the Faculty of Science and the Atlantic Veterinary College contributed to the identification of both the agent and its source and to the development of an ongoing monitoring programme to ensure that toxic levels are never again seen in PEI produced mussels. This research has enabled the mussel industry to rebuild and grow to the point where it now generates approximately \$30M in farm-gate receipts.

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