RESEARCH IN CANADA: PROSPECTS AND CHALLENGES

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Modern scientific research is one of the most legitimate activities of the human spirit: its purpose is to add to the sum total of human knowledge. Fathered by the intellectual awakening of the Renaissance, it has woven, in a short 350-year span, a patchwork of mostly agrarian societies into a global technological civilization, the first of its kind in world history.

In the West, Japan, and some countries of the Pacific Rim, this transition is fairly complete, the rate of change having roughly followed the rapid rise in population levels triggered by the onset of the Industrial Revolution and of better health care. The transformation did not occur without difficulties: any technological transition that came after the beginning of rapid population growth created massive social disruptions, along with severe shortages of essential services.

As for Canada, scientific research is alive and well here because its development roughly followed the rise of the country as an industrial power after World War I. Early successes, such as the discovery in 1921 of insulin in Toronto by Banting, Best and McLeod, the early works of Rutherford on atomic structure at McGill University in the dawn years of the century, and after World War II, the pioneering spectroscopic studies of free radicals by G. Herzberg of the NRC, resulted in the award of four Nobel Prizes. Examples of excellence in contemporary Canadian research abound: developments in robotics (Spar Aerospace's 'Canadarm' for the space shuttle); numerical transmission of signals (Bell Northern, University of Ottawa); pharmaceuticals (Bristol-Myers, Frosst); many areas of medicine such as endocrinology, genetics and the diagnosis of sexually transmitted diseases; civil engineering (Lavalin, Hydro-Quebec); and nuclear engineering (AECL's CANDU). Excellent work is also being performed in many other areas such as organometallics, heat-resistant ceramics and conductive polymers, laser development and optical technology, plasma physics, Canadian Shield geology, and Arctic oceanography, to name a few. Finally, the recent opening of a Biotechnology Institute in Montreal will probably permit a synergistic interaction of this relatively new branch of science with the older, more traditional, pharmaceutical firms already established there.

> "The most important thing now for research in Canada is that its present level of funding must be sustained."
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> Professor John Polanyi
> University of Toronto
> Nobel Prize for Chemistry, 1986

It has been estimated that each dollar invested in research will eventually return to the national economy 50 times that amount, in the form of new technologies. In most cases, this process may take as long as 25 years. Thus modern scientific research has become more of a long-term, capital-intensive investment in a nation's future wealth, without any hope for immediate benefits. Because of this, a comprehensive research team cannot be built overnight: it will take between 10 and 15 years before world-class research can be conducted. Dismantling any established group because of short-term funding problems will usually spell the irretrievable loss of leadership. If cuts must absolutely be made, these must be implemented in ways that preserve this leadership in the key areas that a country with limited resources views as paramount, and with the most potential for economic growth.

Because of the long-term benefits for economic growth generated by research, it has been calculated that an industrialized nation must spend annually at least 2% of its GDP for research and development, in order to keep native technological innovation at self-sustaining levels. In turn, new technologies will spur economic growth that largely compensates for the decline of non-competitive industries. Nations with slowly-expanding populations, such as Canada, cannot rely on rapid population growth to generate more demand, as they were able to do in the past; rather, they must focus on innovation. The nations of the G-7 (formerly G-5) group have made great progress toward that goal. Five of those countries have been sustaining a 2% level for the last ten years.