Editorial & Letters

EDITORIAL

Science Policy in Canada

Canada's 1998 budget overturns 3 years' worth of funding cuts to its three research granting councils and provides a turnaround for basic science. How did we get here? Partly through realizing the benefits of Canada's now strong economy and its first balanced budget in 29 years. Partly through a wrenching process of cuts and prioritization occurring over several years.

After the 1993 election, the Chrétien government faced competing challenges. Expenditures had to be reduced. Canada was spending about $160 billion each year, with revenues of about $120 billion. Yet science efforts were vital to economic growth. How to proceed?

As Secretary of State for Science, Research and Development, I worked with John Manley, Minister of Industry, to focus initially on business R&D, an area where Canada has lagged. We emphasized the information superhighway and environmental and space technologies to help businesses, while also facilitating basic science and science culture development. Examples included an academic–industry consortium, CANARIE, to build and use broadband networks; SchoolNet, Computers for Schools, and a Community Access Program to help schools and rural communities connect to and use the Internet; and a digital collections initiative (for libraries and historical material). Despite the deficit, the Canadian Space Program had to be renewed, so $1 billion of new funding over ten years was provided in 1994. Efforts in space were refocused emphasizing economic benefits and Canadian science's strengths.

A second thrust addressed science-industry links and venture capital. Much mature university and federal laboratory science had commercial applications. A new tax-advantaged, labor-sponsored venture capital fund was established for medical science (the Canadian Medical Discovery Fund), as well as a broader Science and Technology Growth Fund. In both cases, the fund was linked to reviews of the science involving the granting councils, in order to provide an evaluation using expert knowledge. Regional economic development agencies like Western Economic Diversification provided new high-tech loan investment funds. University-industry links were promoted with a Technology Partnership Program and new Networks of Centres of Excellence (NCEs)(national targeted university-industry consortia) in applied health, sustainable forestry, technology-based learning, and advanced materials.

In early 1996, after extensive consultations, a new strategy called Science and Technology for the New Century was created, and a major new technology development fund (Technology Partnerships Canada) was implemented. It provided $150 million in year 1, increasing to $250 million by year 3, or $2.3 billion over 10 years.* The momentum continued in the 1997 budget: The NCE program received significant long-term funding (about $50 million per year, or $1 billion over the next 20 years). To lower industry R&D costs, tax benefits were maintained, and for small businesses the Industrial Research Assistance Program was continued. A Health Services Research Fund ($65 million) was established in 1996 to improve the application of science to health care delivery. The aptly named Data Liberation Initiative made Statistics Canada information readily available to university researchers.

The 1995 budget decreased basic science funding less than than that of other programs (10 to 15% compared to 20% in most areas, and 40% for most government economic support programs).† The '96 and '97 budgets could not reverse this trend, given a potential domino effect on other reductions. But the '97 budget really set the stage for science, providing $800 million for university research infrastructure. The 1998 Canadian budget reverses all previous cuts for basic science while instituting new incremental funds. There is a net increase of $400 million for the Medical Research Council, Natural Sciences and Engineering Research Council, and the Social Sciences and Humanities Research Council by the year 2001, as well as $2.5 billion in new scholarships and other initiatives to help postsecondary education students.

Where next? A clear plan and funding approach is needed for international science participation. The National Advisory Board on Science and Technology (NABST) recommended a more vigorous research effort to support social programs.‡ Along with continued growth in research council funding, consideration should be given to a Canadian National Institutes of Health. Science and technology investments remain vital to national success.

Jon Gerrard

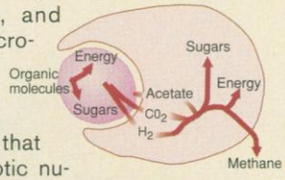
The author is a professor of pediatrics and child health at the University of Manitoba in Winnipeg, Manitoba, and the former Secretary of State for Science, Research and Development for Canada in the Chrétien Cabinet

* W. Kondro, *Lancet* **347**, 256 (1996). †D. Powell, *Science* **267**, 1418 (1995). ‡ NABST, *Healthy, Wealthy and Wise*, Government of Canada, Ottawa (1995).

LETTERS

Origins

Coral researchers propose that both parrotfish bites and a fungus are causing damage to coral in Central and South America, the Caribbean, and Florida. Microbiologists offer support for the hypothesis that the eukaryotic nucleus "originated in a methanogen" (above, drawing showing possible exchanges of molecules, including hydrogen, binding microbes together in an early complex cell). Other letters discuss "the earliest Americans," brain function, the early Black Sea, fertilizer use, seal research, and hemophilia.



Coral Disease

Last year, it was reported that rapid-wasting disease (RWD) killed scleractinian corals at rates as high as 7.5 centimeters of tissue in 24 hours (Random Samples, 27 June 1997, p. 1979). An international group of scientists representing diverse disciplines is collaborating to investigate what we now believe to be two different, but related, syndromes that we term parrotfish white spot biting (PWSB) and rapid-wasting syndrome (RWS). Both of these have been seen in South and Central America, throughout the Caribbean and in Florida (*1*).

More recent observations have shown that the condition initially described as RWD spreads less rapidly than previously thought and that the large white dead zones are actually bite lesions where coral tissue and skeleton have been forcibly removed by parrotfish (A. Bruckner and R. Bruckner, Letters, 27 Mar., p. 2023). PWSB is a phenomenon of corals related to bites by *Sparisoma viride*, the stoplight parrotfish. *S. viride* inflicts overlapping bite marks on the coral, with deep excavation, and frequently returns to the same coral to inflict additional damage. Large mid-phase and terminal-phase males exhibit this biting behavior most often (*2*). The lesions are most commonly found on all morphotypes of *Montastraea* species and on *Colpophyllia natans* (which previously has not been documented as a grazing target of *S. viride*). Some corals fail to recover from the bite damage, because algae have colonized areas of skel-