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# Canada's research funding system shows success

Canada produces far more top-rated environmental science than would be expected, given its size, experts say. They credit Canada's grant system, which gives researchers more freedom than the U.S. approach does.

A 2002 [profile](#) of Canadian environmental science from the Observatoire des Sciences et des Technologies, a nongovernmental measurement organization, reveals that from 1980 to 1998, Canadian scientists overall published 21,503 articles in 317 journals, compared with 137,692 articles by U.S. scientists in the same journals. However, on a per capita basis, Canadian scientists are publishing 60% more environmental science than their U.S. colleagues. In addition, Canadian researchers dedicate 4.6% of all their scientific publications to environmental sciences, outstripping the United States' 3.7% rate, says Frederic Bertrand, a coauthor of the report and a project director at Science-Metrix, a science measurement company.

More important, the quality of Canadian papers has been steadily gaining, say observers. By 1998, the last year for which data are available, Canada ranked second internationally in terms of "expected citations"—the average number of citations received by the journals in which papers are published—and just 3% behind the United States, says Bertrand. Although figures for environmental science alone are not available, Canada's funding for all science programs combined is thrifty, with per capita funding levels about 39% lower than those in the United States, he adds.

A pillar of Canada's funding system is the Natural Sciences and Engineering Research Council (NSERC) discovery grant, five-year awards averaging \$26,400 per year that allow scientists to follow any research track. "It's a perfect fit to how science is done," says John Smol, an aquatic ecologist at Queen's University and the 2004 winner of the Herzberg Medal, Canada's highest science award. "I did not anticipate any of my top 10 [cited] contributions, and the idea for them probably came in year two or three of the funding cycle after attending a meeting or hearing a talk," he adds. Discovery grants are guaranteed, as long as applicants maintain a good record over the previous five years.

In contrast, the U.S. National Science Foundation (NSF) grants for core research projects provide more money over a 3–4-year period but are much more competitive, says Dave Schindler, an aquatic ecologist at the University of Alberta and a winner of the Stockholm Water Prize, environmental science's equivalent of the Nobel Prize. The win big–lose big cycles of the NSF system discourage continuity in research programs, says Schindler, a veteran of both U.S. and Canadian universities. "If you run into a minor screwup in your research program, you lose your funding after just getting a program started," he reports. "The funding stability you get under the NSERC system is a good factor."

The NSF proposals are also a bigger challenge to write; they comprise 15 pages, compared with NSERC's 5, and have stringent reporting requirements. "NSF could learn some things from NSERC and not pay for overhead costs, which can run about 50% at American universities," Schindler adds.

The larger NSF grants provide more money for the postdoctoral researchers and graduate students who are the engines of cutting-edge labs, counters Alan Tessier, the environmental biology program director at NSF. Although NSF also offers smaller, less-competitive grants, they are not as popular as the core research grants, for which proposals have doubled over the past couple of years, he says.

Canada's environmental research capacity and success get a big boost from star scientists at government labs, which have hired the best people and given them the freedom to explore, says Scott Mabury, an environmental chemist at the University of Toronto. However, Tom McElroy, a senior research scientist with the Meteorological Service of Canada, warns that drastic cuts to the government lab system since the mid-1990s are endangering long-term monitoring and research projects. These programs contribute to Canada's leadership and are crucial to solving environmental problems, such as climate change and ozone depletion, he adds. —JANET PELLE

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