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Natural Sciences and Engineering Research Council of Canada

NSERC Contact

Investing in people, discovery and innovation

Catching Up

Editorial by NSERC President Tom Brzustowski

Many Christmas cards from my friends have included a letter reviewing the past year. I appreciate these letters because they help me catch up with the year's important events in their lives. This piece might be thought of as such a letter to help the NSERC community catch up with some important events in the life of the Council in 1999.

Strategy

During the summer, a task force of Council members concluded a year-long review of our strategy. Events had made that review long overdue, even though NSERC's last strategy document was only four years old. A great deal had changed in our environment since 1994, not just in terms of numbers and budgets, but in important qualitative ways as well. And the pace of that change is not slowing down.

Here is what I consider the single most important conclusion of the strategy review: The environment within which the Council operates is changing so rapidly that updating NSERC's strategy must become a continuing process. A strategy document every few years will no longer do. A strategy update will now be an agenda item at *every* meeting of Council.

To meet the needs of the Canadian NSE research community in a changing world, NSERC must be inventive, responsive, flexible, and capable of thinking strategically and acting fast. But we must balance that need with the need to preserve the core values of research in the natural sciences and engineering. We have to have a clear vision of the benefits that research might bring to the country that pays for it and, to be successful in the mission of realizing those benefits, we must pursue the essential objective of increasing Canadian support for NSE research to a level that is competitive by international standards.

One incidental benefit of the long process of strategy review was a clear and concise graphical representation of what NSERC does, how we do it, and why. It was produced initially as an aid to our own understanding, but has proved to be very useful in explaining NSERC to others. This diagram is shown on page 2. (A larger version will be available on our Web site in January, in the "About NSERC" section.)

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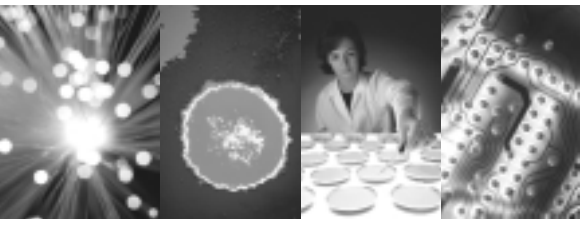

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NSERC is Canada's instrument for promoting and supporting university research in the natural sciences and engineering, other than the health sciences.

NSERC supports both basic university research through research grants and project research through partnerships of universities with industry, as well as the advanced training of highly qualified people in both areas.

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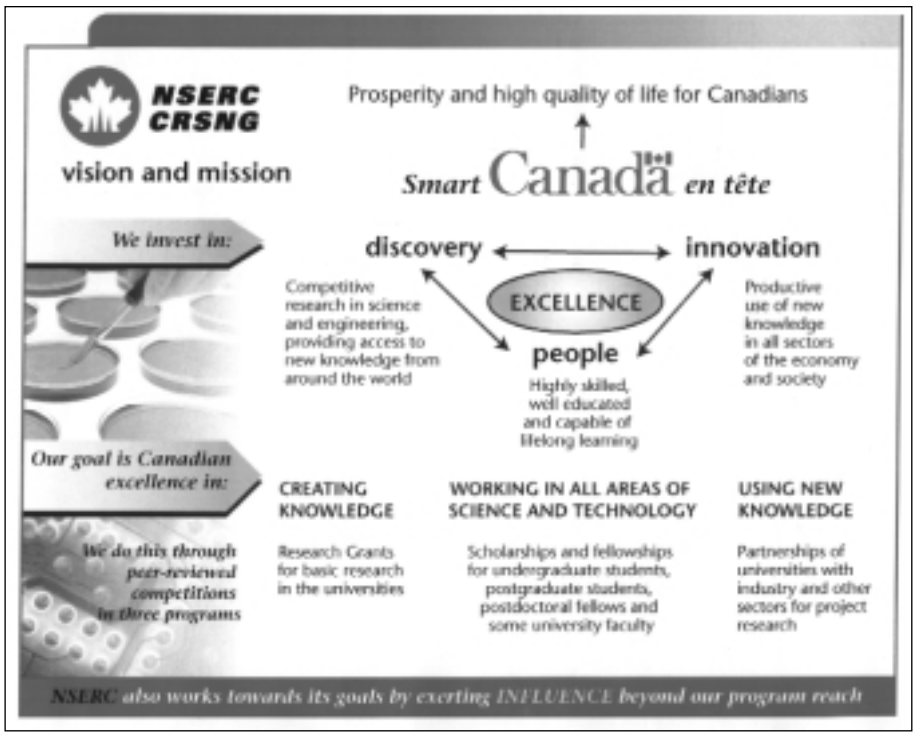

Two other conclusions of the strategy review are worth noting. One is that NSERC has decided to support research in colleges. This means moving beyond the current practice of limiting the eligibility of college faculty to those who are adjunct professors in universities. We are now working out the details, but we've already added the words "and colleges" after "universities" in our mission statement, to signal the change. We will begin with research projects in which colleges are partners with universities. With the experience of CFI as a guide, we expect that a small number of very good projects might be enhanced by this move.

The other conclusion that I wish to bring to your attention concerns influence. Council has known for some time that NSERC has been influential beyond the reach of our programs, in matters such as faculty promotions, for example. However, now Council has decided to use NSERC's influence strategically to deal with issues that affect research in science and engineering in Canada but lie beyond our mandate as a federal agency. We can do that by engaging in science promotion, as Council has decided to do in taking over the Michael Smith Award (see page 4). But we can also do it through partnerships. For example, it might be possible to improve the quality of science and math teaching in our schools by entering into partnerships with the provinces with a view to providing teachers with some first-hand exposure to university research.

The Fortier Report

The final report of the Expert Panel on Commercialization of University Research (the Fortier Report) was published early in June. In September and October, I led a consultation across the country to obtain a reaction to the report from a much wider community than had been consulted by the Expert Panel. In the event, the consultation team heard from 579 people in 86 meetings across the country, and received another 52 written submissions. The people we met represented or belonged to 101 organizations, and many of those had held their own briefings on the Fortier report before meeting with us.

This was a thorough consultation, and I think it was very productive. I will not go into the details here, because a record of the consultation will have been published elsewhere before this edition of *Contact* reaches you. Suffice it to say that I have submitted my advice to the minister, and we now await the government's decision. And whatever that decision turns out to be, NSERC will very likely have a role in implementing it.

21st Century Chairs

In responding to the Speech From the Throne in October, the Prime Minister announced that the government would create 2000 21st Century Chairs for Research Excellence, 1200 in the first three years, and the rest as soon as possible after that, and that this chair program would be permanent. I expect that more than 800 NSE researchers will be appointed to these chairs, half of them senior chairs funded at $200,000 per year, and half junior chairs at $100,000, with no matching funds required in either case. The selection of chair holders will undoubtedly involve the peer review of candidates, and the universities will probably have a great deal of flexibility in how they spend the funds of the chairs to support their research. The detailed plans for the Chair program are now being developed, and will likely be announced at the time of the 2000-2001 federal Budget. Whatever they are, you can be sure NSERC will be heavily involved.

It's a good thing that Council decided that NSERC had to begin updating its strategy continuously. The times are changing and NSERC is ready to change with them.

Taiwan-Canada Science

Since the Canada-Taiwan MOU was signed in the fall of 1998 (see *Contact*, Vol. 23, No. 4, p. 7), the Pacific nation has been vigorously pursuing exchange possibilities.

"With facilities so expensive these days, international cooperation makes more sense than ever before," says Dr. Joseph Hsu, (Director General, Taipei Economic and Cultural Office, Canada).

Three of Taiwan's National Laboratories are especially interested in exchanges with Canadian scientists and engineers: the National Centre for Research on Earthquake Engineering, the National Centre for High Performance Computing, and the National Nano Device Laboratory.

"We've had many visits from top Canadian high-tech companies like Mitel, Newbridge and Nortel, who are interested in some of our informatics projects, and we are working on establishing a relationship with the remote-sensing people at Carleton University that will help us deal with our earthquake problem," says Dr Hsu.

Taiwan is in a major earthquake zone, and many towns and cities suffered severe destruction in a quake this fall.

"We are very grateful to the Canadian experts who came to Taiwan to help," said Dr. Hsu, "and we look forward to further cooperation in the future. We are also prepared to provide support to our postdoctoral and senior Ph.D. students to enable them to study in Canada."

Information on Taiwan's science programs can be found at www.nsc.gov.tw.

NSERC at a Glance

We've updated our popular promotional brochure, "NSERC at a Glance." As the title implies, it's a clear and succinct introduction to NSERC. Visit our Web site, www.nserc.ca/publicat.htm, and check it out!

You can obtain copies of the brochure from our Distribution Centre by calling (613) 992-4265 or sending an e-mail to distribution@nserc.ca. You will also be able to get a copy of the brochure text, reproduced as a handy, faxable fact sheet, from the Distribution Centre in January.

Nominate Your Favourite Science Promoter for a Michael Smith Award

NSERC recently assumed responsibility for the Michael Smith Awards for Science Promotion from Industry Canada. These awards honour individuals and groups who make an outstanding contribution to the promotion of science in Canada through activities encouraging popular interest or developing science abilities.

Up to five winners (individuals or groups) may be selected for the award each year, and their achievements will be celebrated at a special ceremony. Individual winners will receive a personal award of $5,000; organizations will be awarded $10,000 to further science promotion activities. Nominations will be accepted from January to April 1, 2000.

Throughout his career, Dr. Smith has strongly encouraged young people to pursue science as a career and he has been personally committed to science promotion. He became the inspiration for the creation of these awards when he donated part of his 1993 Nobel Prize (in Chemistry) money to science promotion activities.

Building public understanding of science research has always been part of NSERC's mandate. Public understanding of science translates into more informed public decisions, and continued support for research.

To find out how to nominate someone, visit our new Web page: www.nserc.ca/michaelsmith-e in January, call 613-947-2524, or send a fax (613-943-0742) or an e-mail (michaelsmithawards@nserc.ca).

Photo courtesy of Industry Canada

Dr. Michael Smith and some young science enthusiasts.

New Program Launched:
Chairs in Design Engineering

NSERC will invest up to $16 million over the next five years in a new program—Chairs in Design Engineering—aimed at improving the level and quality of design engineering activity in Canadian universities.

Although our university-based research has produced excellent results, our capacity for innovation has lagged behind. One of the major gaps in Canada's innovation system is the shortage of people with the knowledge and skills to make innovation happen. To help universities meet the growing demand for design engineering talent and to help them create and develop new and innovative designs, design concepts and design tools, NSERC will establish sixteen Chairs in Design Engineering over the next three years.

The first phase of the program will see the creation of five Chairs in Environmental Design Engineering. These chairs, to be located regionally across Canada, will focus on products, processes and technologies that are environmentally friendly and ecologically efficient. Universities were invited to submit proposals for this phase by December 15, 1999; NSERC expects to announce its decisions by March 1, 2000.

During the second and third phases, the program will be expanded to include an additional eleven Chairs in Design Engineering. The deadline for Phase Two submissions is May 1, 2000.

Chairholders will be appointed for a five-year term. NSERC will match financial contributions from sponsoring private and public organizations up to $1 million. Full application details can be found on NSERC's Web site, at www.nserc.ca/programs/design_eng_e2.htm.

Announcing...

The Gerhard Herzberg Canada Gold Medal for Science and Engineering

Winner to Receive $1 Million for Research

Gerhard Herzberg would be pleased. Winners of NSERC's top award—renamed in his honour—will receive $1 million, distributed over five years, to apply to their own university research or to such related activities as the establishment of research scholarships, fellowships, or chairs at Canadian universities that they select.

Julie Payette at the ceremony in Montreal, beside a rendering of the Herzberg Medal.

Dr. Herzberg, winner of Canada's first Nobel Prize in Chemistry for his work in molecular spectroscopy, was an indefatigable champion of science, which he regarded as an endeavour of humankind that must be supported.

At a ceremony in Montreal on November 25, 1999, to announce the award and unveil the new medal, Secretary of State (Science, Research and Development) Dr. Gilbert Normand described the purpose behind the prize. "This dramatic new award," he said, "will celebrate great Canadian achievements in research and move the best Canadian researchers to a new level of research support. It will inspire all Canadians, and especially young citizens, with the excitement of science and engineering in Canada."

NSERC President Dr. Tom Brzustowski added that, in addition to celebrating "Canadian heroes, of which Dr. Herzberg was one of our greatest, we want to provide them with a new level of research support that Canadian researchers have never enjoyed before."

The Herzberg Medal (which replaces NSERC's previous award, the Canada Gold Medal for Science and Engineering) will be awarded for both the sustained excellence and the overall influence of a body of work conducted in Canada in the natural sciences or engineering.

Nominees' work must demonstrate an unusually high degree of expertise, creativity, imagination, leadership, perseverance and dedication.

The winner will be selected from three finalists. The Herzberg Medalist will receive $1 million over five years. If the winner already has an NSERC Research Grant, his or her grant will be increased to $200,000 for each of the five years. If the grant is currently greater than $150,000, it will be topped up by $50,000. A winner who is not an NSERC Research Grant recipient may direct the full $200,000 to university research endeavours such as scholarships. The other two finalists will each receive a one-time award of $50,000, applicable to their own research or a similar endeavour of their choice.

Scientists and engineers working in universities, government laboratories and private corporations may be nominated. Nominees who are ineligible for NSERC research grants (such as those who work in government laboratories) may direct their awards to research or the establishment of scholarships, fellowship or chairs in the Canadian university of their choice.

Among the distinguished guests who attended the unveiling ceremony was Dr. Agnes Herzberg, daughter of the Nobel laureate. "That NSERC has chosen to name the Gold Medal for Science and Engineering after my father is a high honour, and by encouraging Canada's best scientists to follow in his footsteps, he will not be forgotten," she commented.

Astronaut and NSERC Council Member Julie Payette was also enthusiastic: "NSERC could not have come up with a better choice for recognizing our star researchers in Canada than to name its most prestigious prize after an astonishing man whose first love was, precisely, to study the stars!"

The brochure on the new award will be available in early January, in print and on our Web site (see box).

Dates to remember

Call for Nominations: January, 2000
Nomination deadline: April 1, 2000
Selection of three finalists:
October, 2000
Announcement of Medalist:
November, 2000

For more information

Ask for our brochure
The Herzberg Medal
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or
Visit NSERC's Web site:
www/nserc.ca/about/awardeng.htm

Thin Films: New Angles, New Applications

He calls them "crazy films." Dr. Michael Brett, the Alberta Microelectronic Corporation (AMC)/NSERC Senior Industrial Research Chair in Thin Film Engineering at the University of Alberta, is exploring how thin films of materials can be manufactured and manipulated. This past September, Dr. Brett talked to NSERC about his latest research.

(front row, left to right) **Jeremy Sit**, **Michael Brett**, **Mary Seto**, and **Doug Vick**; *(back row, left to right)* **Brian Dick**, **Scott Kennedy**, **Ken Harris**, **Albert Huizinga** and **Andy Wu**.

Thin films are resilient coatings that are used in a host of ways, including as optical filters, coatings for VCR and audio tapes, and insulation. They are also used for labels and packaging, and to improve items' durability. The films, which can be as little as one micrometre thick, are produced by heating a source material inside a vacuum and condensing the resulting vapour as a film on the end product.

Now, using a new technique for making these films, Dr. Brett and his team of research students have created the next generation of thin films with promising applications in such fields as optics, magnetic storage, resonators and sensing.

This process is called Glancing Angle Deposition (GLAD), and it has enabled Dr. Brett and his students to grow columns with "crazy" shapes: zig-zags, staircases, helices, inclined columns, and capped or multi-layered structures. In essence, they have developed thin films whose microstructures or constituent "columns" are inclined at what Dr. Brett calls "absurd angles"—up to 80 degrees—while moving the source material or substrate at varying speeds to control the final shape.

"The optics applications are particularly exciting," says Dr. Brett. "We're developing technology with potential breakthroughs in optical filters and displays." In one successful ongoing experiment, Dr. Brett's team has filled porous helical columns with liquid crystals. The resulting film may enhance the optical performance of flat-panel displays, by enabling energy-efficient polarization of light.

Dr. Brett's thin films also have the potential to better protect materials exposed to extreme heat. Jet engine turbine blades, for example, are exposed to super-high temperatures, and are currently protected by a coating made from compound zirconia. But zirconia coating may peel off over time due to mechanical stress from frequent temperature variation. So Dr. Brett's team has grown multi-layered porous zirconia film. "The pores could increase thermal protection and provide stress relief," says Dr. Brett.

Porous thin films have other advantages. Dr. Brett has found that silica films made of a porous array of posts absorb humidity quickly and are the basis for a fast-response humidity sensor. Furthermore, Dr. Brett's porous films could also be the technology that takes computer-storage capacity to the next level, by enabling inexpensive fabrication of microscopic arrays of magnetic dots. The idea is to develop magnetic storage devices that would store significantly more gigabytes per square inch.

(continued on page 8)

Winning Partnerships Honoured

Some of the 1999 Synergy Award winners, shown at the awards presentation during the Innovation Conference: Platforms for Organizational Growth, October 22 in Calgary. (The conference was sponsored by The Conference Board of Canada with financial assistance from NSERC.)

Read about these and the other winning partnerships in the 1999 brochure *Synergy Awards for R&D Partnerships*, which you can find on our Web site, at www.nserc.ca/publicat.htm.

University - Industry Synergy

(left to right) **Dr. Tom Brzustowski**, President of NSERC, **Dr. Robert Stewart**, CREWES Project Director, and **Dr. James R. Nininger**, President and Chief Executive Officer, The Conference Board of Canada.

(front row, left to right) **Dr. Antony Marsh**, President, CMC, **Dr. Doug Colton**, Past President, CMC, and **Mr. David Brown**, Group Director, Cadence Design Systems (Canada); *(back row, left to right)* **Mr. Dan Gale**, Vice-President, CMC, **Mr. Leo Derikx**, the former NSERC Director General of Research Partnerships, for whom this award was named, and **Dr. Ron Johnston**, University of Calgary.

Continued from page 7

Dr. Brett's research into thin films comprising spring-shaped columns could benefit a wide range of electronics devices as well. Presently, he notes, electronic filters and resonators are "fabricated from solid materials." His team, however, has developed "beds" of micro-springs with all kinds of geometries. "We can vary the number of turns, thicknesses, materials, pitches and diameters, so that potentially we may optimize frequency behavior for communications devices."

In the meantime, says Dr. Brett, his primary challenge is determining which discoveries to pursue. His team is already working on prototypes of some devices, including a liquid crystal device for optical displays. "Thanks to ongoing support from my NSERC Chair and corporate sponsors, we're exploring each field a bit further, to identify which applications will be the winners. Our goal is to spin off the best technologies we can develop with GLAD thin films."