nce

Networks of Centres of Excellence

15 years
1989-2004

EXCELLENCE has no fixed address

The NCE Pioneers

Building a 21st Century Economy

From BSE to Climate Change

Networks of Centres of Excellence of Canada
Réseaux de centres d'excellence du Canada

Canada

The Networks of Centres of Excellence

Current Networks

Advanced Technologies

Canadian Institute for Photonic Innovations – CIPI (1999-2009)
Université Laval, Quebec, Québec
Scientific Director:
Dr. Robert Fedosejevs
www.cipi.ulaval.ca

GEOIDE – Geomatics for Informed Decisions Network (1998-2009)
Université Laval, Quebec, Québec
Scientific Director:
Dr. Keith Thomson
www.geoide.ulaval.ca

IRIS – Institute for Robotics and Intelligent Systems (1989-2005)
Precarn Incorporated,
Ottawa, Ontario
Scientific Director:
Dr. Bernie D. MacIsaac
www.precarn.ca

Micronet – Microelectronic Devices, Circuits and Systems (1989-2005)
University of Toronto,
Toronto, Ontario
Scientific Director:
Dr. André Salama
www.micronetrd.ca

MITACS – Mathematics of Information Technology and Complex Systems (1998-2009)
Simon Fraser University,
Burnaby, British Columbia
Scientific Director:
Dr. Arvind Gupta
www.mitacs.ca

Engineering and Manufacturing

AUTO21 – The Automobile of the 21st Century (2000-2005)
University of Windsor,
Windsor, Ontario
Scientific Director:
Dr. Peter R. Frise
www.auto21.ca

ISIS Canada – Intelligent Sensing for Innovative Structures (1995-2006)
University of Manitoba,
Winnipeg, Manitoba
Scientific Director:
Dr. Aftab Mufti
www.isiscanada.com

Health, Human Development and Biotechnology

Advanced Foods and Materials Network – AFMNet (2003-2008)
University of Guelph,
Guelph, Ontario
Scientific Director:
Dr. Rickey Yada
www.afmnet.ca

AllerGen – Allergy, Genes and Environment Network (2004-2009)
McMaster University,
Hamilton, Ontario
Scientific Director:
Dr. Judah Denburg

Canadian Arthritis Network – CAN (1998-2009)
Mount Sinai Hospital,
Toronto, Ontario
Scientific Co-Directors:
Drs. Jane Aubin and A. Robin Poole
www.arthritisnetwork.ca

Canadian Bacterial Diseases Network – CBDN (1989-2005)
University of Calgary,
Calgary, Alberta
Scientific Director:
Dr. Julian Davies
www.cbdn.ca

Canadian Genetic Diseases Network – CGDN (1989-2005)
University of British Columbia,
Vancouver, British Columbia
Scientific Director:
Dr. Michael Hayden
www.cgdn.ca

Canadian Language and Literacy Research Network (2000-2005)
University of Western Ontario,
London, Ontario
Scientific Director:
Dr. Donald Jamieson
www.cllrnet.ca

CANVAC – Canadian Network for Vaccines and Immunotherapeutics (1999-2006)
Université de Montréal,
Montreal, Québec
Scientific Director:
Dr. Rafick-Pierre Sékaly
www.canvacc.org

Canadian Stroke Network – CSN (1999-2006)
University of Ottawa,
Ottawa, Ontario
Scientific Director:
Dr. Antoine M. Hakim
www.canadianstrokenetwork.ca

PENCE Inc. – Protein Engineering Network (1989-2005)
University of Alberta,
Edmonton, Alberta
Scientific Director:
Dr. Steve Withers
www.pence.ca

Stem Cell Network – SCN (2000-2005)
University of Ottawa,
Ottawa, Ontario
Scientific Director:
Dr. Ronald G. Worton
www.stemcellnetwork.ca

Natural Resources and Environment

AquaNet – Network in Aquaculture (1999-2006)
Memorial University of Newfoundland,
St. John's, Newfoundland
Scientific Director:
Dr. Scott McKinley
www.aquanet.ca

ArcticNet (2003-2008)
Université Laval,
Quebec, Québec
Scientific Director:
Dr. Louis Fortier
www.arcticnet.ulaval.ca

Canadian Water Network – CWN (2000-2005)
University of Waterloo,
Waterloo, Ontario
Scientific Director:
Dr. Marc Servos
www.cwn-rce.ca

Sustainable Forest Management Network – SFM (1995-2006)
University of Alberta,
Edmonton, Alberta
Scientific Director:
Dr. James W. Fyles
www.ualberta.ca/sfm

Previously funded Networks

Canadian Ageing Research Network – CARNET (1989-1994)
University of Toronto,
Toronto, Ontario

Canadian Institute for Telecommunications Research – CITR (1989-2003)
McGill University,
Montreal, Québec

Canadian Network for Space Research – CNSR (1989-1994)
University of Calgary,
Calgary, Alberta

Centres of Excellence in Molecular and Interfacial Dynamics – CEMAID (1989-1994)
Université de Montréal,
Montreal, Québec

Concrete Canada (1989-1998)
University of Sherbrooke,
Sherbrooke, Québec

Health Evidence Application and Linkage Network – HEALNet (1995-2002)
McMaster University,
Hamilton, Ontario

Insect Biotech Canada (IBC) – Biotechnology for Insect Pest Management (1989-1994)
Queen's University,
Kingston, Ontario

Inspiraplex – Respiratory Health Network of Centres of Excellence – (1989-1998)
Montreal Chest Hospital Centre,
Montreal, Québec

Mechanical Wood-Pulps Network (1989-2004)
Pulp and Paper Research Institute of Canada,
Pointe-Claire, Québec

NeuroScience Network – (1989-1998)
Montreal General Hospital,
Montreal, Québec

Ocean Production Enhancement Network – OPEN (1989-1994)
Dalhousie University,
Halifax, Nova Scotia

TeleLearning Network of Centres of Excellence (1995-2002)
Simon Fraser University,
Burnaby, British Columbia

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Networks of Centres of Excellence

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"Excellence has no fixed address"

Made-in-Canada **Experiment** Becomes **Global Standard** for Scientific Collaboration

Over 15 years ago, leaders from academia, industry and government came together to create a new model for scientific collaboration, training and knowledge transfer. Their vision gave birth to the Networks of Centres of Excellence. It was a made-in-Canada solution for a uniquely Canadian challenge.

By Debbie Lawes

Geography has always been a defining factor in shaping Canada's history, its society, its economy, and more recently, its science. It has forced leaders to think of creative ways to overcome the barriers of distance to unite our country's social and economic fabric. For science, it has inspired a uniquely made-in-Canada approach to collaboration that is proving vital to the health and economic well-being of the country.

ArcticNet researchers are using the Amundsen icebreaker to better understand Canada's changing north.

Up until the 1980s, and just prior to the arrival of the Internet, the challenge was far more obvious than the solution. How do you bring together the country's brightest minds from the natural, health and social sciences to build a critical mass of research talent that can respond to issues that matter to Canadians? And how do you do this during a time of tight fiscal restraint?

"The idea was to build critical mass from a distance, by using modern technology in order to get people to communicate with each other," says Dr. Stuart Smith, who chaired the Science Council of Canada between 1982-87. "They also wanted to see if it was possible to take curiosity-driven research and slant it in a direction of commercial application. It was an attempt to try to deal with Canada's deficit in long-term applied research."

Both ideas were radical at the time and received only lukewarm response from many academics—if not outright opposition. First, there was the logistics of communications. There was as yet no national broadband network connecting Canada's public research laboratories. Second, collaborative research from a distance, particularly multi-disciplinary research, generally wasn't done. Engineers simply didn't work with health scientists and economists. And third, applied research and university-industry partnerships were considered sacrilege in many academic circles.

"You had to persuade all these scientists that they had to break bread with the Imperial

> "It doesn't at all hurt curiosity-driven research to be constantly reminded of where the real problems are."
>
> *Dr. Stuart Smith*
>
> *Chairman, Ensyn Technologies Inc.*

Oils of the world… Of course, they bridled at that," recalls Dr. Smith.

By the late 1980s, however, this radical idea had won the support of researchers from coast to coast, as well as industry and political leaders. In January 1988, the federal government announced the $240-million Networks of Centres of Excellence. By 2004, it would become the longest-running network program of its kind anywhere in the world.

The three federal granting councils, representing the health, natural sciences, and social sciences and humanities, were charged with organizing the process and administering the networks. It represented the first time that the councils were able to support key groups of researchers with a critical mass of funding over an extended period of time.

The process itself received high marks in an editorial published December 28, 1988, in the RE$EARCH MONEY newsletter:

"Although it has yet to shell out a single penny for research, the federal Networks of Centres of Excellence (NCE) program already has many significant accomplishments to its credit. No other research funding competition has aroused more enthusiasm than this one. Scientists, engineers and scholars from coast to coast are striking up new alliances that may last well beyond the bounds of this competition."

Dr. Arthur May

A New Era in Canadian Science

On October 26, 1989, William Winegard, then Minister of State for Science and Technology, announced the first 14 networks that would be established under the NCE program. The government also announced a five-year, $200-million budget increase for the three granting councils: the Natural Sciences and Engineering Research Council (NSERC), the Medical Research Council and the Social Sciences and Humanities Research Council (SSHRC).

Exactly one year later, to the day, the federal government announced the creation of CA*net—Canada's first dedicated broadband research network connecting universities and government labs across the country.

A new era in Canadian science was born.

"This was a huge program. It was by far the single largest program the Government of Canada had ever done in the field of science. It was very visionary," says Dr. Smith, currently chair of Ensyn Technologies Inc. of Ottawa.

In hindsight, the $240 million would also turn out to be the first down payment on a major reinvestment in Canada's university research capacity.

"Since the mid-1980s, advanced networks like CA*net have evolved in lock step with the research community's exploration of new ways of collaborating at a distance. CANARIE is proud to have been able to play its part in supporting the development of new virtual centres of excellence through the NCE program, and we anticipate many more years of exciting collaboration, developing Canada's 'intelligent' infrastructure together."

Dr. Andrew Bjerring
President/CEO
CANARIE Inc.

"I often used a phrase, particularly when I came to Memorial, 'excellence has no fixed address'… It's part of the way in which Canada works in education, health care and social programs that these kinds of collaborations in scientific research are natural, and the NCE program is the glue that binds it together."

Dr. Arthur May
Past President, NSERC

"At the time, people viewed the support of university research as inadequate. They saw a flat trend. The NCE program began to change that," says Dr. Arthur May, past President of both NSERC and Memorial University of Newfoundland.

It would still be several years before the research funding tap was fully opened, and again, it was the NCE program that led the pack. In its February 1997 budget, the federal government announced that the NCE program would become permanent. That same budget included $800 million for the new Canada Foundation for Innovation university infrastructure program.

The long drought of science and technology funding was finally ending. The next few years would see subsequent decisions to increase the NCE's base budget by $30 million (bringing it to $77.4 million), to significantly boost funding to the three research granting councils, and to create two new national programs, the Canada Research Chairs and Genome Canada.

Dr. Fraser Mustard: Visionary and Pragmatist

Dr. Fraser Mustard is an early champion of the Networks of Centres of Excellence program. During the early 1980s, he and other founders of the Canadian Institute of Advanced Research saw an opportunity to greatly expand Canada's research capacity by linking researchers from different universities and different disciplines from across the country.

As the NCE program celebrates its 15th anniversary, Debbie Lawes spoke with Dr. Mustard from his office in Toronto to discuss his views on why the program is still needed today, and his thoughts for its future.

DL: Why is the NCE program still relevant today?

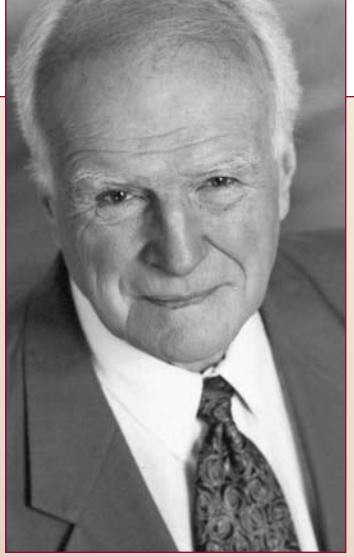
FM: If you want to maintain a geopolitical entity called Canada, you need to maximize the strengths across the country to hit certain targets. You still need to build national networks of capability in complex fields to build the research capability to be competitive with other jurisdictions. We know it works and that mix is unique in the world at the present moment. To lose that, being a small country thinly spread out, would be a tragic mistake. You would not have the linkages across the country that are necessary to build the dynamics for the future.

DL: Is Canada funding the NCE to adequate levels?

FM: No. You have to be funded on a per capita basis that is relative to the competing regions of the world that you are working with or in.

DL: What is the danger in under-funding a program like this?

FM: It gets eroded. Once you cut back on opportunities for talented people, they will leave your country. It's as simple as that.



DL: How do you see the NCE's role compared to that of the granting councils?

FM: If you could develop it in a way that would provide for a degree of integration with the granting councils, you would have a real gain for the whole system.

DL: Do you have other suggestions on how the NCE might evolve?

FM: I think there are two things they need to do. They need to think through the sustainability factor. Rather than cutting off networks after fourteen years, they need to find an evolutionary way of assessing them, at least for those networks that are highly relevant and moving with the field.

Secondly, make it capable for them to easily expand the participation or involvement in a network. I know at PENCE, we worked quite hard to bring in bright young people because we didn't want it to become an old boys' club.

DL: How would the NCE realize these objectives?

FM: You have to have the talent in the system that understands what it is that has to be done, and you have to have a network of people who have been groomed and who are prepared to do the job once you've put it in place.

(Dr. Mustard is also on the Board of Directors of PENCE – the Protein Engineering Network.)

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The Visionaries

The idea of creating a national Networks of Centres of Excellence program first surfaced around 1985, just as Dr. May was taking over the helm at NSERC. He recalls being fairly new to the top job when a passionate and persuasive scientist came into his office to "set him straight" on what was needed to improve Canada's research climate.

"I hadn't been at NSERC long when Fraser (Mustard) came into my office and for about an hour, went at me about networking and the idea of a university without walls," says Dr. May, who currently chairs the Advisory Board for the Atlantic Innovation Fund. "His rationale was that there are nodes of excellence here and there and they should be linked without having to move people around."

The first seeds for the idea of a "university without walls" appear to have been sown by the Canadian Institute for Advanced Research (CIAR). Founding President Dr. Fraser Mustard says the objective of CIAR was not to fund the "doing of research," but to create networks of people "to advance frameworks of understanding in complex fields, such as cosmology, superconnectivity, population health and economic growth."

In 1987, the five-year-old CIAR was described by RE$EARCH MONEY as "a radically different way of building research strength in Canada."

"Above all, CIAR's concept bucks the traditional view that critical mass can only be attained by consolidating experts in a central complex," states a July 8, 1987 article. "Instead, its researchers are widely distributed among Canada's leading universities, and are webbed together by telecommunications and modern transportation."

The CIAR concept provided momentum for the Ontario Centres of Excellence program, as well as the NCE. But unlike CIAR, Dr. Mustard said it was essential that these new networks fund actual research which involved talent from multiple institutions and disciplines. "The experience we had in Ontario, plus our experience with CIAR, led to building a capacity to put this in place across the country," he says.

Dr. May credits Dr. Mustard with transforming him and others from skeptics to champions of the NCE vision.

Did You Know?

In 2003-04, a total of 882 companies, 243 provincial and federal government departments and agencies, 49 hospitals, 184 universities, and 326 other organizations from Canada and abroad were involved in the **NCE program**.

"I was a bit of a doubting Thomas when I first heard the idea. But it was because of Fraser Mustard's loquaciousness and eloquence on the subject that I became a believer to the point where I put up a fight to have NSERC and the other granting councils deliver the program," says Dr. May.

By June 1988, the NCE program had begun to take shape. The three granting councils convened a 23-member international peer review committee chaired by Dr. Smith to evaluate the applications. At the same time, Dr. John Evans, then CEO of Allelix Inc., and former University of Montreal rector Dr. Gilles Cloutier were appointed to captain an eminent 12-person advisory team that would oversee the thoroughness and integrity of the selection process.

NCE Governance

The NCE program is jointly administered by Canada's three federal granting agencies: the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council (NSERC) and the Social Sciences and Humanities Research Council (SSHRC), in partnership with Industry Canada.

Governance Structure

Industry Canada

- NSERC
- SSHRC

Health Canada

- CIHR

Steering Committee
Presidents of the three granting agencies
Deputy Minister, Industry Canada

Management Committee
Vice-Presidents
Directors General of the three granting agencies
NCE Program Director

International, Peer and Selection Committees

Secretariat
Program and Communications Staff

NCE Boards of Directors

The response was overwhelming. The NCE received 238 letters of intent totalling $3 billion, from a who's who of Canadian S&T. That number was whittled down to 158 formal applications, with virtually every industrial research association or institute, and every major Canadian university, taking a lead role in one or more of the proposals.

The process ended with the final selection of 14 networks, representing over 800 researchers from across Canada. (The Canadian Ageing Network joined the list shortly after.) The scientific fields covered were extensive: biotechnology, natural resources, telecommunications and microelectronics, infectious diseases, robotics and intelligent systems, protein engineering, neuroscience, space, advanced materials and processes, human genetic diseases, respiratory health and human ageing.

Five of those original networks are still operating today, and one has morphed into a private-sector enterprise (see pages 8-11).

Industry Partnerships

How unique was the NCE program at the time?

Dr. Evans, who chairs both Torstar Corporation and the Canada Foundation for Innovation (CFI), recalls that the NCE was one of the earliest initiatives in Canada to encourage universities to partner with industry, as well as with government laboratories.

The goal was to help universities to produce research that is needed, and to narrow the widening gap between research and commercialization.

Dr. John Evans

"It was thought of less in the area of technology transfer at that point, and more in the idea of bringing the research strengths of industry into much closer relationships with the academic sciences," says Dr. Evans.

The launch of the NCE paralleled the emergence of a biotechnology industry across North America. It was a promising new field in which the United States was taking an early lead. According to another former NSERC president, Dr. Peter Morand, the NCE program accelerated Canada's move into this space by launching seven networks that were health or biotechnology related.

Dr. Peter Morand

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"There was a lot of criticism at the time that Canada was a branch-plant country in terms of the pharma industry, because there wasn't really much going on in the bio-sciences industry in Canada," says Dr. Morand, who is now President and CEO of the Canadian Science and Technology Growth Fund.

Those new NCE provided the fuel needed to ignite Canada's biotechnology industry: highly trained graduate students and researchers, new technologies, and in several cases, new companies.

Today, approximately half of all NCE researchers are working with the group of nine networks that come under the program's Health, Human Development and Biotechnology categories. "Some of these are seeding significant improvements in the quality of care in the health system," says Dr. Tom Brzustowski, who chairs the NCE Steering Committee as the President of NSERC. "I'd like to see even more NCE in health care."

Since 1994, seven health-related NCE have spun out 36 companies to commercialize new technologies.

"The networks have a very strong impact in developing Canada's capabilities in the life sciences sector and in creating that receptor capacity," adds Dr. Morand, who is on the boards of both the Canadian Bacterial Diseases Network and the Canadian Institute for Photonic Innovations (CIPI).

The President and CEO of Genome Canada recalls his days as a venture capitalist in Quebec and his experience with NCE spin-offs. "When we targeted a company, it was not rare to find out they were a spin-off of an NCE, not only in health, but other sectors," says Dr. Martin Godbout.

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An NCE Retrospective

- January 1988: The Prime Minister announces the $240-million NCE program as a new four-year initiative.

  The three federal granting councils are mandated to conduct a competitive, peer-review process involving international experts.

- 1989: First 14 networks are selected for funding.
- 1990: A 15th network is added.
- 1993: Federal government announces Phase II of the NCE program with a four-year budget of $197 million.
- 1994: 10 of the original 15 networks are selected to continue in Phase II.
- 1994: A competition for new Phase II networks is announced. Funding is set at $48 million over four years.
- July 1995: Four new networks are announced: ISIS Canada; Sustainable Forest Management Network; HEALNet; and TeleLearning.
- February 1997: The NCE becomes a permanent program with an annual budget of $47.4 million.
- October 1997: Seven networks are renewed, representing an investment of $94.3 million over four years: Canadian Bacterial Diseases Network; Canadian Genetic Diseases Network; Micronet; Canadian Institute for Telecommunications Research; Mechanical Wood Pulps Network; IRIS; and PENCE.
- July 1998: Four networks are renewed, receiving $35 million in continued funding: HEALNet; ISIS; Sustainable Forest Management Network; and TeleLearning.
- October 1998: Three new networks are announced: Canadian Arthritis Network; GEOIDE; and MITACS.
- February 1999: A federal budget increase of $30 million per year for the NCE Program brings its annual budget to what it is presently, $77.4 million.
- May 1999: Canadian Institute for Photonic Innovations is announced.
- February 2000: Three new networks are announced; AquaNet; Canadian Stroke Network; and CANVAC.
- March 2001: Four new networks are announced: AUTO21; Canadian Language and Literacy Research Network; Canadian Water Network; and Stem Cell Network.
- October 2001: Five networks are renewed for their second and last seven-year funding cycle: Canadian Bacterial Diseases Network; Canadian Genetic Diseases Network; IRIS; Micronet, and PENCE. Four others successfully pass their first mid-term review in the fourth year of their first seven-year funding cycle: Canadian Arthritis Network; Canadian Institute for Photonic Innovations; GEOIDE; and MITACS.
- July 2003: Two new networks are announced: ArcticNet; and Advanced Foods and Materials Network.
- November 2004: AllerGen Network is announced.

The NCE Pioneers

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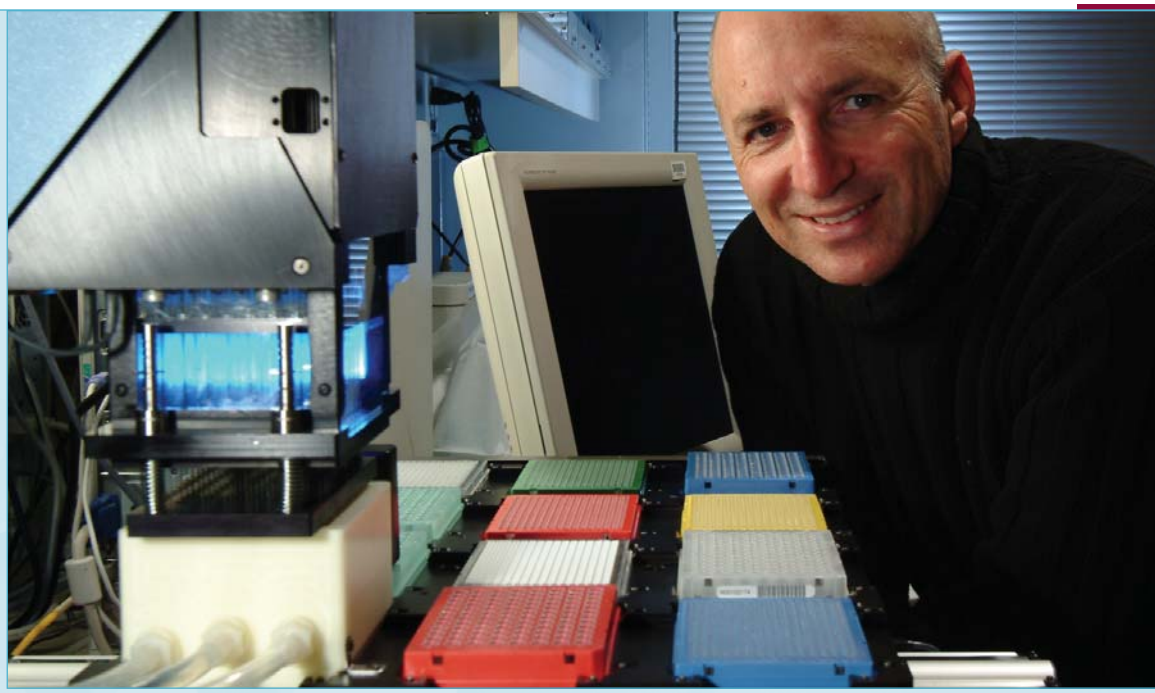
MANY OF THE NCE'S GREATEST ACCOMPLISHMENTS HAVE COME FROM ITS FOUNDING NETWORKS, PARTICULARLY THOSE THAT HAVE CONTINUED UNTIL TODAY. FIVE OF THOSE NETWORKS ARE NOW REACHING THE LIMIT OF THEIR NCE-FUNDED RESEARCH CYCLES. OTTAWA WRITER JOE SORNBERGER SPOKE WITH SCIENTIFIC DIRECTORS AND MANAGERS TO LEARN HOW CANADA HAS BENEFITED FROM THEIR RESEARCH SUCCESSES, AND TO DISCUSS THEIR PLANS FOR THE FUTURE.

Dr. Michael Hayden: From silos to networks

A decade after founding the Canadian Genetic Diseases Network (CGDN), Dr. Michael R. Hayden is struck by the shift in culture that occurred on his watch.

"Fifteen years ago, it was an institutionally based and parochially driven genetics research environment," says Dr. Hayden, one of just two original scientific directors at the NCE and director of the Centre for Molecular Medicine and Therapeutics at the University of British Columbia.



Dr. Michael R. Hayden

"People were focused on their own institution, on their own labs. They had success, but not nearly at the level of what could be accomplished by working with researchers across the country. The concept of core facilities serving national interest wasn't there. It wasn't seen."

Dr. Hayden, a past winner of the Canadian Society for Clinical Investigation Award and the 2001 recipient of the Award of Excellence from the Genetics Society of Canada, takes pride in having helped knock down the walls that kept researchers toiling in isolation.

"We have changed this culture into families of researchers. I feel very fortunate, having been one of the founders and having had that impact."

That change in thinking helped put Canada in the forefront of genetic research. "Canada became, through this process, the country that has identified the most genes for diseases in the world. It's over 50." ‰

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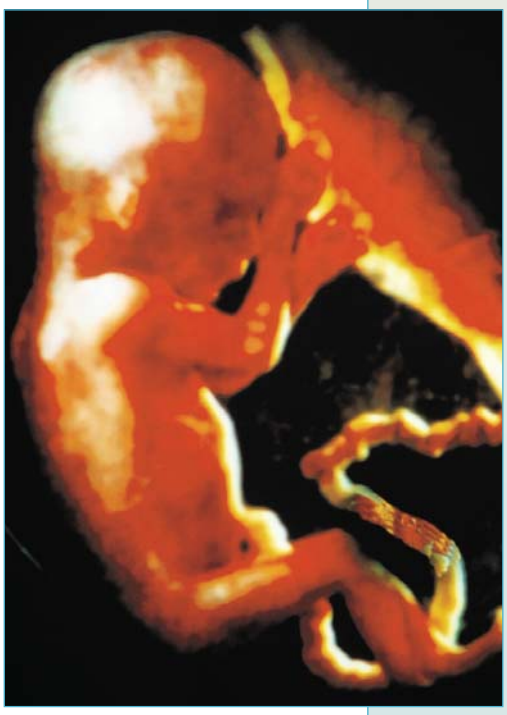
In that respect, CGDN has led the way, most recently finding the genetic mutation for Crohn's disease, a development that will help speed diagnosis of the often misdiagnosed inflammatory bowel disorder.

Beyond creating a better research culture, Dr. Hayden helped create a more financially stable one. Three successful CGDN spin-off companies now employ about 180 people in total.

"And if you look at the payroll, that's about $7 million to $8 million for these people who are all paying taxes. What we are generating in federal and provincial taxes is about equivalent to what the federal government gives us, about $3.5 million. And we are going to go on and on!"



CGDN: Ready for the future

Effective research, strong industry partnerships and a string of company spin-offs will help the Canadian Genetic Diseases Network to live on after it graduates from the NCE program next spring.

Having secured $500,000 in NCE funding to manage its two-year transition to sustainability, the CGDN has formed enough partnerships to carry on through 2009, says CGDN's Scientific Director, Dr. Michael Hayden.

"We will be on the scene for another 15 years, assuming our spin-off companies go liquid and our investment pays off, at a level where we are funding $2.5-million in research annually," says Dr. Hayden, who cites a string of successes on which the network can build.

"We were first to identify and patent the gene that is crucial for influencing HDL (the good cholesterol) in humans," he says. That discovery led to a 2000 deal with American drug giant Pfizer and allowed CGDN spin-off Xenon Pharmaceuticals to land the highest-ever private equity financing for an independent biotech firm, a figure Dr. Hayden puts at "around $84 million."

Xenon topped that this year with a $200-million investment by the Swiss-based Novartis Pharma AG, which came in as a partner on the strength of Xenon's discovery of SCD1, a regulatory enzyme believed to hold the key to fighting obesity.

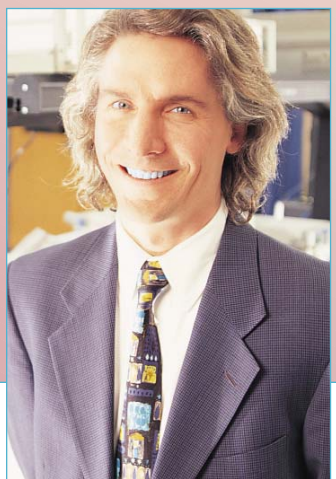
Another CGDN spin-off, Victoria-based Aspreva Pharmaceuticals, was started three years ago to address the lack of available therapeutics for less-common diseases by using new applications for existing drugs. Aspreva partnered with F. Hoffmann-La Roche in 2003 and, bolstered by $80 million in private equity funding this year, is developing CellCept, originally used to fight rejection of transplanted organs, as a therapy for auto-immune diseases such as lupus.

Meanwhile, Aegera Therapeutics Inc., a Montreal-based CGDN partner, recently added six patents on and around the inhibitors of the apoptosis (cell death) gene family, bringing the total number to 19. Aegera, a key player in the development of apoptosis-related therapeutics, received $20 million in new venture capital earlier this year to take its cancer-fighting therapy to clinical human trials.

"CGDN is fulfilling a role in the future in funding the discoveries and translating these discoveries into benefits for Canada and the benefit of those companies," says Dr. Hayden. "That's the real story."

A New Network is Born: The $7-million NSERC-funded Agile All-Photonics Network (AAPN), hosted at McGill University, can trace its genesis to some forward-thinking researchers with an earlier NCE network, the Canadian Institute of Telecommunications Research (CITR). AAPN's founding Scientific Director, Dr. David Plant, worked for 10 years as an investigator and major project leader with CITR. As the network was reaching its end in 2003, its President, Dr. Birendra Prasada, encouraged Dr. Plant to apply to NSERC for a new virtual network—one that would eventually link fourteen professors at five universities with industry and government partners. CITR provided valuable support during the writing of the application.

Dr. Plant says his experience with CITR taught him valuable lessons in collaborating with colleagues in other cities, and the importance of doing "mission-oriented" research.



"I benefited immensely from the tutelage and experience of being part of an NCE," says Dr. Plant, who also does research with the Canadian Institute for Photonic Innovations. "I am deeply indebted to the NCE program because it played a significant role in launching my career at McGill."

Micronet: Riding the **tech wave**

As Micronet R&D enters its final phase as an NCE—the microelectronics research network will wind down operations in 2005—its founder takes considerable pride in how the organization thrived despite the industry's roller coaster ride of the past 14 years.

After a decade of flying high, the technology sector saw boom turn to bust just after the new century dawned and no one, including Micronet, was left unscathed.

Despite the economic downturn, Micronet successfully expanded a network of investigators, linked them with industry and trained hundreds of professionals who are now helping lead the industry into recovery.

Scientific Director Dr. André Salama says Micronet successfully spun off a dozen enterprises, including Smart Camera Technologies of Calgary and Sirific Wireless Corp., a fabless RF semiconductor company based in Waterloo, Ontario. "Half of the spin-offs are still there, while the others were absorbed by larger companies that have kept a presence in Canada."

Micronet contributed significantly to bringing focus—particularly an industrially relevant focus—to microelectronic research, says Dr. Salama.

"It actively brought industry on board and enhanced industry-industry cooperation. The highly qualified personnel we created have always been very actively sought out. Our graduate students are getting jobs in companies across Canada as well as the United States."

Photo: Micronet

A Micronet researcher at work.

Dr. André Salama: Life After Micronet

Dr. André Salama may be winding down the activities at Micronet R&D, but he is far from winding down his own work.

Dr. André Salama

One of two original scientific directors to have been with their respective networks since the beginnings of the NCE, Dr. Salama will carry on his outstanding work as a professor in the Faculty of Applied Science and Engineering at the University of Toronto.

"I'm still doing my own research work, leading toward the next generation of circuits and systems," says Dr. Salama, holder of the J.M. Ham Chair in Microelectronics at U of T and winner of the Canada Council's I. W. Killam Memorial Prize in Engineering in 1994.

If he has one regret about Micronet's departure, it is that the research network he built will fade.

"The only thing which is regrettable is that there is no clear-cut option to continue this in a constructive fashion," he says. "We built up quite a capability which is going to disappear. There is no mechanism to try to continue the work or keep the momentum going—that is the only disappointing part."

Dr . Salama believes Canada needs to do more to stay competitive. "We need much more focused programs than what we have. If you look at Taiwan, Sweden and Belgium, they have made a commitment in this field. If we want Canada to play a significant role in the future in microelectronics or nanoelectronics, we really need much more support."

What does he see as his legacy with Micronet?

"We were successful in bringing people together—not only from the university side, but also from a university-industry point of view. We created a cohesive roadmap for research which had a significant impact on our sector."

IRIS: Studying new models

After 14 years, the Institute for Robotics and Intelligent Systems (IRIS) feels confident in billing itself as "the largest, the most complex and the most productive" of the NCE. "Our technology is also multi-sectoral," says Paul Johnston, Vice-President, Operations at Precarn Inc.

Ottawa-based Precarn manages IRIS, which is a not-for-profit consortium of corporations, research institutes and government partners working within the intelligent systems industry.

Current IRIS projects range from building an autonomous aquatic walking robot to developing intelligent computational support to analyze gene expression profiles. While some IRIS researchers are devising 3D ultrasound systems for image-guided surgery, others are creating non-player characters with human-like behaviour for computer games.

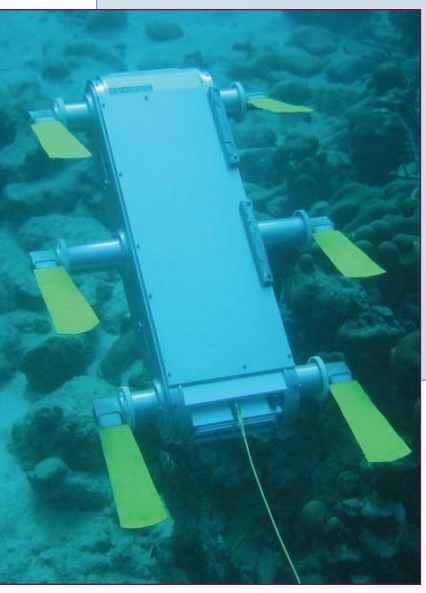
That far-reaching, broad scope of work will carry on in 2005. IRIS has secured $250,000 in interim funding from the NCE to transform itself into a new model for supporting the industrial application of intelligent systems research. The exact look and feel of the new IRIS, however, has yet to be determined.

"Certainly some aspects will be the same," says Mr. Johnston. "We know how to work with intelligent systems academics now and we will continue to work with them."

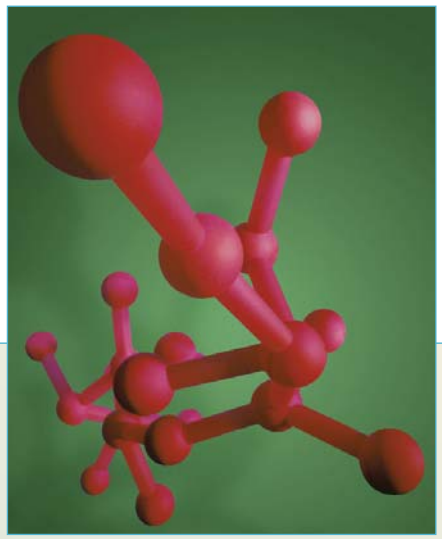
Precarn sponsors industrial research, says Mr. Johnston, "while on the IRIS side, it directly supports academics who interact with industry." There has been increasing integration over the years, with both Precarn and IRIS operating out of the same Ottawa office.

Mr. Johnston says IRIS has played a key role in spurring universities to undertake application-based research. "It has transformed how some of these professors work and attracted into it those who are interested in working with industry."

Many of those academics have seen potential for industrial applications first-hand. Of the 33 companies that have spun off from IRIS, 25 are still in business today. "The spin-offs show the measure of productivity," says Mr. Johnston. "Some will grow into really good operating companies."



The IRIS-developed AQUA robot can walk and swim in any direction, provide a 3D image of what it sees and find its way home again.



PENCE: The future is global

Having built a solid international reputation over the past 14 years, the Protein Engineering Network of Centres of Excellence is taking the next logical step as it graduates from the NCE in 2005: It is going global.

"We want to morph ourselves into a network that would not be NCE-funded but could deal with emerging infectious diseases," says Dr. Stephen Withers, PENCE's Scientific Director since 2000 and an original principal investigator. "We're working with a number of similar groups in other countries to come up with an international consortium on anti-infectious, antiviral therapeutics. We're in discussions with Germany, France, Australia and Britain."

Much work has already been done. An international workshop held last May in Toronto will be followed up with another in Paris late this year or early next. "The French government will be funding that one," says Dr. Withers. "It will be a mix of science and policy on how we're going to move this forward."

The complex field of proteomics—the study of the structure and function of proteins—has become increasingly important in the wake of the SARS outbreak of 2003. PENCE was quick to mobilize when SARS struck Toronto, after originating in China. PENCE set up a competition in May to develop new therapeutics.

The SARS effort illustrates the extent to which PENCE succeeded in bringing together researchers from across the country on common goals. "We have done some fantastic science that has made PENCE internationally known in the world of proteomics. We have helped put Canada on the map."

PAPIER's "smart" paper coming soon

Life didn't end for the Mechanical Wood-Pulps Network (MWPN) after NCE funding came to an end two years ago. It just changed.

The former NCE network is now the Canadian Pulp and Paper Network for Innovation in Education and Research (PAPIER), which acts as a catalyst for major pulp and paper research projects with commercial applications.

Diagnostic paper could reveal if meat is safe to eat.

"PAPIER is different than MWPN," says Dr. George Rosenberg, the new organization's Managing Director. "That was a research network. At PAPIER we try to coordinate projects between universities and industry. We supply some up-front money to develop the research proposal, but the actual funding of the research is done with external money."

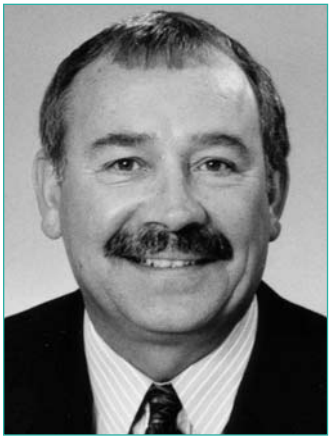
The biggest undertaking to date is Sentinel, a multi-disciplinary research project investigating the commercial applications of bio-active paper. The five-year, $10-million research program has $2.5 million committed from industry. PAPIER is seeking another $7.5 million from the Natural Sciences and Engineering Research Council. Industry partners will be making in-kind contributions worth another $5 million.

"Think of paper that is used to wrap food," says Dr. Rosenberg. "Think of diagnostic packaging that can tell you whether that food is safe to eat—a window on your package that goes from green to red. We're going to attach bio-sensors based on antibodies or enzymes. The potential product applications are immense."

PAPIER, with infrastructure support from Paprican, the pulp and paper industry's R&D arm, is building on the strengths developed with the NCE.

"What PAPIER is really trying to do," says Dr. Rosenberg, "is be the single point of access for mobilizing the capacity of Canada's universities. If there are issues that require research that the industry needs, they have access to the entire resources at universities across Canada."

CBDN: Research will continue



Dr. Donald E. Woods

Dr. Donald E. Woods remembers the first organizational meeting for what would become the Canadian Bacterial Diseases Network in 1989 in Vancouver.

"You could tell everyone was tense," says Dr. Woods, the CBDN's Scientific Director from 1996 to 2002. "All of us had met at various meetings and conferences, but none of us had ever been in one room together."

The CBDN brought together a collection of bacteria scientists who, until then, had been keen competitors for a limited amount of research money and a fixed number of academic jobs. Many balked at pooling their talents and sharing their discoveries. "I can remember thinking, 'This will never work'," says Dr. Woods.

The shift in thinking did not come easily. "It took some time, a couple of years, and there were bumps in the road. But I have no regrets whatsoever. The opportunity I had—to work on something new and change the direction of my lab—would not have happened without the NCE. They made monies available to pursue things that were high-risk."

The CBDN projects that Dr. Woods led—using genetics, genomics, proteomics and immunological techniques to define the nature of obscure bacterial diseases—allowed his team at the University of Calgary to do groundbreaking work to fight the threat of bioterrorism.

"We started out working on tropical diseases… as it turned out, these vaccines could be important in terms of bioterrorism attacks."

Dr. Woods now travels to Washington, D.C. where, at the request of the National Institutes of Health, he helps American scientists "get up to speed on some of the things we've been working on."

While the CBDN will end in 2005, its research will carry on. "The work will persist," says Dr. Woods. "We're proud of what we accomplished." — NCE

Meet the NEW Face of Canadian Research

12 PAGE

THE NCE IS HELPING TO TRAIN A NEW BREED OF RESEARCHERS—INDIVIDUALS WHO CAN WORK WITH OTHER SCIENTIFIC DISCIPLINES, COMPANIES AND POLICY MAKERS TO CONDUCT BETTER SCIENCE AND DELIVER BETTER RESULTS.

Dr. Lori Burrows candidly admits that she didn't know much about the NCE program while working as a post-doctoral fellow with the Canadian Bacterial Diseases Network (CBDN) in the early 1990s. Today, as Director of the Centre for Infection and Biomaterials Research at the University of Toronto, she recognizes the significant impact that early training has had on her current job, which includes interacting with industry to develop and commercialize new products.

"That's where the influence of the NCE comes in," she says. "When I was a student in Dr. Joseph Lam's lab at the University of Guelph, I was made aware of the importance of commercialization potential and of working with industry. And now I interact with companies in my own work."

From CBDN to Sick Kids: Dr. Lori Burrows' current research evolved from her post-doctoral work with the CBDN. At the Hospital for Sick Children Research Institute, she is studying Pseudomonas aeruginosa, an organism that causes many hospital infections. Her group is looking into how the bacteria attach themselves to surfaces, such as medical instruments. Their goal is to develop coatings for these medical devices that will prevent the bacteria from attaching, growing and causing an infection.

Dr. Burrows is also an Associate Professor in the Department of Surgery at the University of Toronto, as well as a researcher at the Hospital for Sick Children Research Institute. She first became aware of the NCE program in the early 1990s when her PhD supervisor was involved with CBDN.

The NCE program welcomes students from all levels: undergraduates, Master's students and PhD candidates, Post-Doctoral Fellows and Research Associates. Many integrate their university work with their network experience by using it to meet their academic requirements, e.g. for a Master's or PhD thesis.

The students work with colleagues from the health, social and natural sciences in multidisciplinary teams involving academic institutions from across the country. They also work with the potential users of the technology—whether they be municipalities, health care organizations or private companies—to guide the research and expedite its transfer to user communities.

"These students are going to be the educators and researchers of tomorrow. They'll start businesses or create policy and regulations. We see their training as one of our key deliverables," says Dr. Allan Paulson, Associate Scientific Director of the Advanced Foods and Materials Network.

Crossing Disciplines

Two researchers at the University of British Columbia are using the multidisciplinary skills they learned through the Canadian Water Network to better train this next generation of researchers. It was at a network meeting where Dr. Hans Schreier, an expert in studying the interaction between land use and water pollution, first met Dr. Judy Isaac-Renton, a microbiologist at the BC Centre for Disease Control. Today, the two are collaborating on three separate research projects that could help to prevent a future Walkerton-type tragedy from occurring.

For their graduate students, crossing disciplines has resulted in a more holistic approach to water research. For example, one of Dr. Schreier's PhD students, Jamie Ross, is learning about microbial techniques in Dr. Isaac-Renton's lab, while one her graduate students, Natalie Prystajecky, will join Dr. Schreier's team in the field as part of her study of bacteria in soil sediments.

"In terms of training for the future, the health component is being integrated into the scientific thinking. That never was there before," says Dr. Isaac-Renton.

Entrepreneurial researchers

Two of the NCE's greatest strengths, according to the program's Director, are its multidisciplinary training and linking students to the communities that ultimately will put the research into practice. "I heard a term recently that describes it quite accurately—highly qualified entrepreneurial people," says Mr. Jean-Claude Gavrel. "By working with partners, NCE students go beyond basic research to understand things like proof-of-concept and product development. These are skills that they can use to start new businesses or to help existing businesses become more competitive."

Dr. Heman Chao was a Post-Doctoral Fellow working with the PENCE network. Today, he is Vice-President (Technology) for Helix BioPharma and President of Sensium Technologies.

Dr. Heman Chao is an NCE alumni who has done just that. In 2002, he joined Helix BioPharma Corp. of Aurora Ont. as Vice-President (Technology). He is also President of its subsidiary company, Sensium Technologies. Prior to joining Helix, he was a Post-Doctoral Fellow coordinating multi-centre research in protein chemistry as part of the PENCE network.

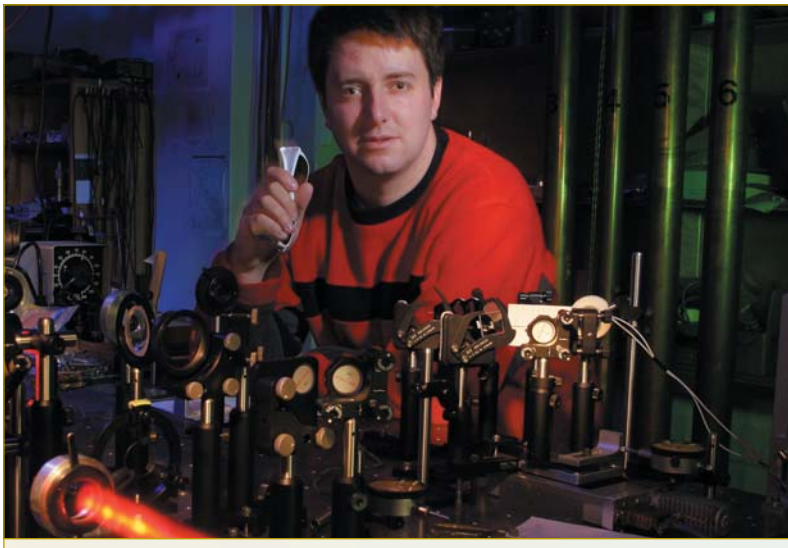
Did You Know?

The Canadian Stroke Network is helping to attract some of Canada's top young minds to stroke research. Through its Focus on Stroke program, the network is supporting **45 university trainees** from across Canada.

"If I followed the traditional post-doctoral training, I would have been well-equipped for an academic or research position. I wouldn't have been given the option to consider business management," he says.

Dr. Chao suggests that NCE-trained students have an advantage over their non-NCE colleagues, primarily because of the multidisciplinary environment. Today, when he looks to hire researchers or technicians, he turns first to NCE graduates. "I look very specifically to hire people who are able to work with a team from different backgrounds."

Dr. Chao adds that the students themselves bring as much to the NCE program as they get out of it. "I think they give back creativity," he says. "Students challenge professors, sometimes with ideas that come out of left field, but that gets a lot of creative thinking going." — NCE



CIPI Student Heads to Harvard: Dr. François Légaré is heading to Harvard University—but he does plan to return to Canada. Selected by Maclean's in 2003 as one of Canada's under-30 "red-hot and cool" Canadians, Dr. Légaré will work with Prof. Xiaoliang Sunney Xie in the Dept. of Chemistry and Chemical Biology to study how the CARS microscope (a device that allows scientists to look at cells without the fluorescence labeling that can be toxic to them) can be applied to cell biology and material science. The Canadian Institute for Photonic Innovations partially funded Dr. Légaré's work as part of his doctoral research at the National Research Council. He hopes to work at a university when he returns to Canada.

NCE **graduates apply** here

Finding work doesn't seem to be a problem for NCE graduates. Of the 711 NCE students who graduated over the past year, 84 percent found employment within industry, academia, government or other organizations.

For Dr. Douglas Barber, Distinguished Professor in Residence at McMaster University, the success rate reflects the reality that NCE trainees are "highly employable."

"Many of these students work not just in university labs, but in private-sector labs, and in collaboration with students in other networks. It's a much richer experience," says Dr. Barber, a founder and former CEO of Gennum. He now serves on Micronet's Board and will join the Board of the newest NCE, AllerGen.

Dr. Douglas Barber

Through the NCE program, many students collaborate with companies on research projects. Some of these students later join the company. "The companies get an earlier connection to these people, so it's a lot easier for them to compete for the ones that they think would be really valuable for their enterprise," adds Dr. Barber. — NCE

Graduate students make a vital contribution to AUTO21's research. These three University of British Columbia students assisted with Dr. Mary Chipman's study into side impact crashes. Left to right: Ali Asadkarami, Owen Robertson and Chris Skipper (all under supervision of Dr. Doug Romilly).

Headquarters for HQP*

STUDENT NETWORKS ADVANCE THE DEVELOPMENT OF THE NEXT GENERATION OF RESEARCHERS

**HQP means highly qualified personnel; i.e. research staff, such as research associates, and research trainees, such as postdoctoral fellows, graduate students and summer students.*

By Monica Hughes

The Canadian Institute for Photonic Innovations (CIPI) and Geomatics for Informed Decisions Network (GEOIDE) are not only linking researchers from coast-to-coast, they are also linking students.

Yannick Lizé, President, CIPI-S

Both CIPI and GEOIDE have launched complementary networks for students to share research ideas and build relationships that can last beyond their academic studies.

"It was part of our initial submission to the NCE program and we were the first network to do this," says Dr. Keith Thomson, Scientific Director of GEOIDE. "The students have taken it on very enthusiastically." The result is the GEOIDE Student Network (GSN).

Yannick Lizé is a PhD candidate and the current president of the CIPI student network, CIPI-S. "We do it because we get something out of it," he explains. "I've made contact with other students, shared experiences with them. I've also made contact with professors in other universities and with industry people."

Both GSN and CIPI-S organize workshops and conferences, and use Web sites as virtual meeting places where students from across the country can disseminate and share information. GEOIDE also runs an annual week-long summer school.

Through the student networks, participants gain valuable skills and knowledge that can help them in their careers, regardless of the path they take. "From the beginning, we had them involved in the management committee," says Dr. Thomson. "We gave them a lot of responsibility and we had a lot of dialog with them based not only on academic matters, but also on social matters and organization of meetings."

A formal organization also gives students a collective voice in the CIPI and GEOIDE networks. Each network has student representation on its board of directors. "They have direct input to us," says Dr. Thomson. "There is a feedback mechanism right there which is very useful to our network because one of our key commitments is to train HQP."

Yannick Lizé agrees. "We can bring the concerns of the students to the organization. And CIPI is great. They appreciate our input." — NCE

BUILDING a 21st Century Economy

By Mark Henderson

As Canada prepares for the realities of a 21st century economy, governments are more acutely aware than ever that R&D on its own does not make a country more prosperous, healthier or safer.

The challenge facing governments, universities, NGOs and even the private sector is how to move evidence-based results—whether they be scientific discoveries, a new engineering marvel or a best practice—from the research team to the industries and communities that can most benefit from this innovation.

Making the connection between the innovation and the marketplace and society is a fine art, underpinned by dogged determination, hard work, solid public policy and strong partnerships.

Canada is not alone in wanting to accelerate commercialization and the transfer of knowledge. The race to innovate and realize the benefits of those innovations is a global race that will determine the economic wealth, competitiveness and social well-being of many countries.

So, what is Canada doing? In short, the government is formulating policies and programs to encourage collaboration between the creators of ideas and those that seek to transform them into goods and services on the economic scale, and a cleaner environment, better health care and higher literacy on the social scale.

Photo: ISIS Canada

ISIS Canada has installed its fibre-based intelligent sensing and structural health monitoring systems in bridges, pipelines and other structures across Canada. These technologies are key to developing 21st Century "smart" civil engineering structures.

"Whether the research is done in government labs, publicly funded institutions, or in universities, it is essential that research outcomes do not remain trapped beyond the reach of private-sector enterprises that can commercialize them and deliver broad-based benefit for Canadians."

Address by

The Honourable David L. Emerson
Minister of Industry

Canadian Chamber of Commerce

Calgary, Alberta
September 20, 2004

If Canada is to realize its 21st century ambitions, both the public and private sectors must have the ability to acquire and exploit the results of research. Canada must have the people with the requisite skills sets and an R&D environment that facilitates partnerships and encourages collaboration.

continued from previous page

Fortunately, Canada is not beginning from a blank slate. Fifteen years ago, a group of forward-thinking individuals convinced the federal government to take a chance on a new concept that would link academic researchers across Canada and encourage interaction with industries and others that actually put this research into practice.

Since its genesis in 1989, the Networks of Centres of Excellence has established a successful track record of virtual networking. This national program has produced leading-edge, targeted research that is helping several industrial sectors to be even more competitive internationally.

Improving Canada's competitive position depends on more than R&D. That is why the NCE's founders built in the capacity to train and retain highly qualified workers. By attracting top researchers to participate in the networks, the NCE program has a huge leveraging effect, training people in a multidisciplinary environment that offers a high degree of national and international linkages.

The impact of the NCE program on Canada's economy and social well-being cannot be overestimated. With its unique focus on commercialization and knowledge translation, it serves as a model upon which Canada can successfully build, transforming challenges into opportunities that will ultimately benefit all Canadians. — NCE

Mark Henderson is Managing Editor of RE$EARCH MONEY (www.researchmoneyinc.com), a specialized newsletter covering Canadian S&T funding and policy.

Putting Research Results to Work

THE NCE PROGRAM IS BRIDGING A CRITICAL GAP BETWEEN WHAT WE KNOW AND WHAT WE DO. IT HAS RESULTED IN RESEARCHERS WORKING WITH COMPANIES AND COMMUNITIES TO TRANSLATE "DISCOVERIES" INTO PRACTICAL SOLUTIONS.

CANVAC: Contacting experts made easy

Dr. Andrew Murdin of Aventis Pasteur credits the NCE, including CANVAC and PENCE, for strengthening his company's research activities in Canada, particularly its cancer vaccine program and the development of immuno-assays.

CANVAC's research was so relevant to Aventis Pasteur that the biotechnology company "couldn't afford not to have some level of partnership."

"These partnerships give us an opportunity to survey the Canadian research environment and centralize some of our activities through one relationship rather than multiple individual relationships," says Dr. Murdin, Director of External R&D at Aventis Pasteur in Toronto.

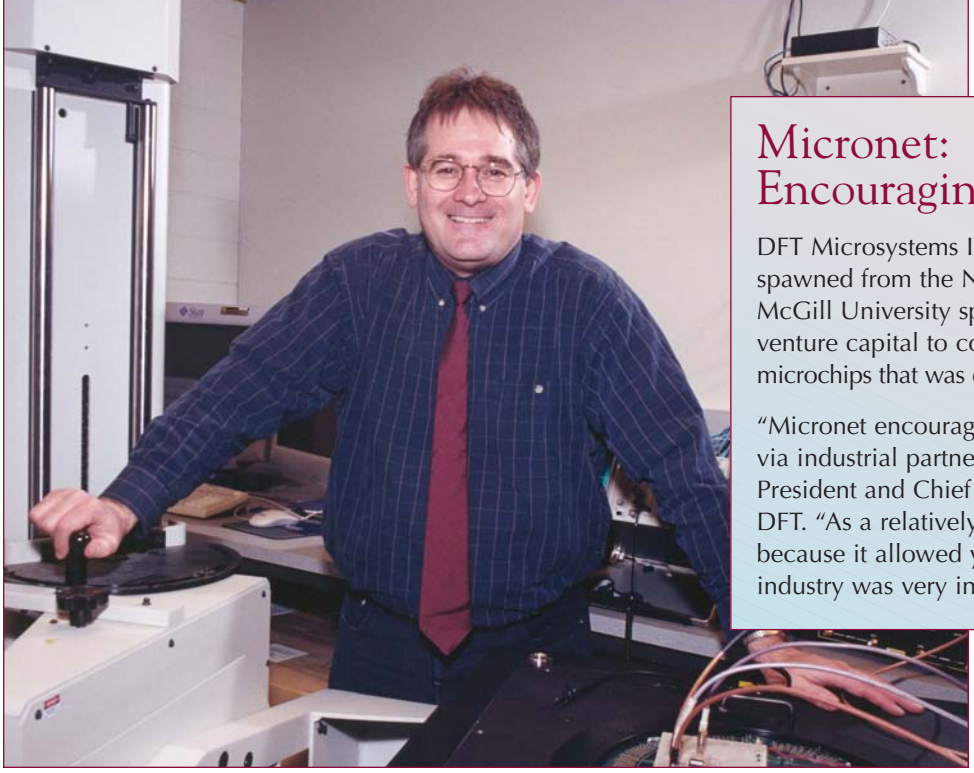
MITACS: Sharing academic expertise

To better understand key mechanisms in a proton exchange membrane (PEM) fuel cell, Ballard Power Systems works with Mathematics of Information Technology and Complex Systems (MITACS) researchers at the University of British Columbia and Simon Fraser University.

"MITACS projects have allowed us to further decrease our reliance on empirical testing and to accelerate design iterations through fundamental understanding," says Dr. Charles Stone, Vice-President of R&D at Ballard.

The Burnaby BC-based company is one of 75 industry partners that have worked with MITACS since 1998.

Photo: Ballard Power Systems



Micronet: Encouraging partnerships

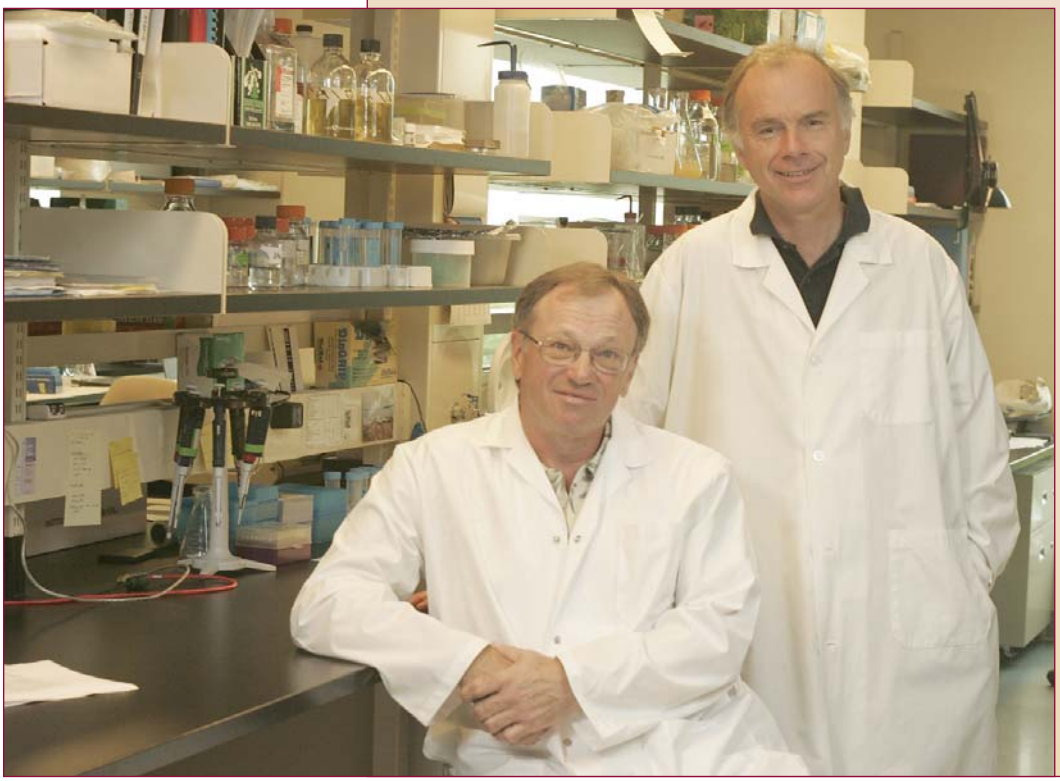
DFT Microsystems Inc. is one of nearly 111 companies spawned from the NCE over the past 12 years. The McGill University spin-off recently raised $4.5 million in venture capital to commercialize a new testing system for microchips that was developed in partnership with Micronet.

"Micronet encouraged the development of our research via industrial partnerships," says Dr. Gordon Roberts, President and Chief Executive Officer of Montreal-based DFT. "As a relatively new researcher, I found this vital because it allowed you to work on something in which industry was very interested."

Dr. Gordon Roberts

Canadian Genetic Diseases Network: Narrowing the gap

The Strategic Grant program at the Canadian Genetic Diseases Network (CGDN) is helping to narrow the gap between the lab bench and the bedside. Drs. Robert Korneluk and Alex MacKenzie of the Children's Hospital of Eastern Ontario tapped into the program to conduct additional research required for proof-of-principle and to protect patent claims. CGDN also helped assemble a high-profile interim management team, secure start-up capital and launch a Montreal start-up to study the therapeutic potential of the research.



That company, Aegera Therapeutics Inc., launched Phase 1 clinical trials in March 2004 for a new drug candidate that could prolong the lives of cancer patients with advanced tumours.

The $800,000 awarded through CGDN's Strategic Grant program has led to the creation of six new biotechnology companies, including Aegera, Xenon Pharmaceuticals Inc., SignalGene Inc., and NeuroVir Therapeutics (acquired by MediGene). These spin-offs have raised more than $135 million in investments and generated over 900 jobs.

Dr. Robert Korneluk (seated) and Dr. Alex MacKenzie are the scientific founders of Aegera Therapeutics Inc.

Canadian Bacterial Diseases Network: Towards an E.coli vaccine

Dr. Andrew Potter

Canadian Bacterial Diseases Network researchers Drs. Brett Finlay and Andrew Potter have developed a vaccine for cattle that reduces the chances of humans being exposed to the same dangerous strain of E. coli that has hit Walkerton and other communities across Canada.

The Alberta Research Council and Bioniche Life Sciences Inc. of Belleville, Ontario, were involved almost from the beginning.

"It's very important with products of this type to make sure that there is a commercial pathway identified up front," says Dr. Potter. "Having private-sector input into the process is invaluable. We can still do good science, but with their help, we can do it in a way that is compatible with commercial development."

Did You Know?

The Registry of the Canadian Stroke Network, the world's most **ambitious** study of stroke patients, is providing a snapshot of stroke care in Canada.

Launched in 2001, the Registry has already collected data on more than 10,000 stroke patients at 21 hospitals across Canada. The information will help health researchers better diagnose and manage stroke and **improve care** and education for future stroke patients and their families.

Stem Cell Network: A new model for commercialization

The Stem Cell Network has brokered an unprecedented agreement among Canada's top scientists and major universities and hospitals to collectively manage intellectual property and create a globally competitive Canadian stem cell company.

The company, as yet unnamed, will have a world-class management team that not only understands stem cell research, but can raise money, develop product lines and clear the innumerable legal and administrative hurdles that stand between research and results.

"I think it's brilliant," says Dr. Calvin Stiller, Chairman and CEO of the Canadian Medical Discoveries Fund. "When you are dealing with very early science, such as stem cell research, finding a way to generate value for everyone, while not creating unrealistic expectations, is very difficult. What this very creative initiative does is spread the risk and the value in an equitable way."

"During the first six years of the Canadian Institute for Photonic Innovations, JDS Uniphase has become the leading manufacturer of optical components for telecommunications… We anticipate that CIPI's research and training activities in photonics will lead to commercially significant outcomes during the recovery phase of the telecommunication industry."

Barrie Keyworth, Director, Wavelength Management, JDS Uniphase

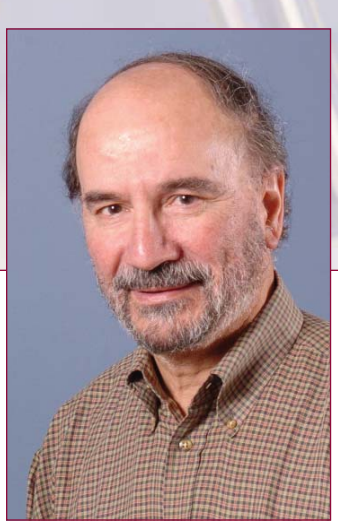
Ottawa, Ontario

PENCE: SARS Web site launched

Researchers, policy makers and the general public are tapping into a new Web site to better understand, analyze and battle the SARS virus.

The SARS Bioinformatics Suite, available at www.sarsresearch.ca, is primarily for research purposes but also contains links to information for the public, including the latest news on SARS. It provides scientists with a database of all available SARS genome sequences, together with a variety of easy-to-use integrated tools for comparing and analyzing the genomes.

The SARS Bioinformatics Suite was developed by PENCE researchers Dr. Rachel Roper and Dr. Chris Upton at the University of Victoria.



Dr. Tassos Anastassiades

"The Canadian Arthritis Network offers an opportunity to work with the researcher and advance these kinds of compounds in development, before you seek a partnership with a biotechnology or pharmaceutical company. The Networks of Centres of Excellence plays a very important role by providing a much-needed addition in terms of technology transfer in Canada."

Dr. Tassos Anastassiades, a Canadian Arthritis Network researcher at Queen's University, who recently patented a glucosamine derivative called Anabu™ that could help relieve the pain and stiffness associated with arthritis.

ISIS Canada: Taking a bite out of risk

IDERS Inc. credits ISIS Canada for helping its Winnipeg-based company to develop a new structural health monitoring system.

In addition to introducing IDERS to this burgeoning field, ISIS also worked with the company to test and validate the technology.

"Now that we're off on our own trying to market the results of this technology, we're finding that having worked with ISIS and having their stamp of approval is opening doors for us," says Vice-President David Fletcher. "Because ISIS is so well renowned internationally, it brings credibility to our technology. We would never have been able to do this on our own."

ISIS researcher Evangeline Rivera field tests the IDERS system at the Taylor Bridge in Headingley, Manitoba, on July 31, 2003. The high-tech box reads data from ISIS-developed "smart" sensors that measure stress levels in bridges and other structures.

AUTO21: Driving public policy

An AUTO21 researcher is working with policy makers to tackle one of Canada's most preventable crimes—auto theft. Dr. Rick Linden, a sociology professor and criminology expert at the University of Manitoba, is leading the first national study of why teenagers—and even children as young as 10 years old—steal vehicles and what practices and programs can be put in place to deter them.

Initial research has found that thrill-seeking and joyriding were the most common reasons for stealing vehicles, and that thieves generally avoided vehicles equipped with anti-theft systems.

Those results prompted one of the study's sponsors, the Manitoba Public Insurance Corp., to offer lower insurance rates for drivers who install anti-theft devices in their vehicles.

"Vehicle thefts have serious economic, social and human costs, and our research suggests that anti-theft devices can have a very immediate and effective impact," says Dr. Linden.

Did You Know?

A recent study estimated health-care savings of more than $3 billion per year through the use of a nutraceutical that **lowers blood** cholesterol as compared to a pharmaceutical drug. These savings alone represent approximately 3% of the annual health care budget of **$100 billion**.

Source: Advanced Foods and Materials Network

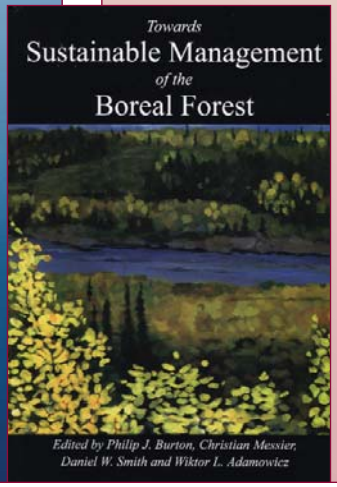
Canadian Water Network: Helping municipalities keep out contaminants

A team of Canadian Water Network researchers is working with local authorities to reduce the risk of another Walkerton-like tragedy.

Dr. Rob de Loë, a Canada Research Chair in Rural Water Management at the University of Guelph, is leading a team of researchers and graduate students from geography, engineering, planning, economics, biology, political science and environmental studies to produce a tool kit of best practices and models that municipalities can use to build local capacity for water management.

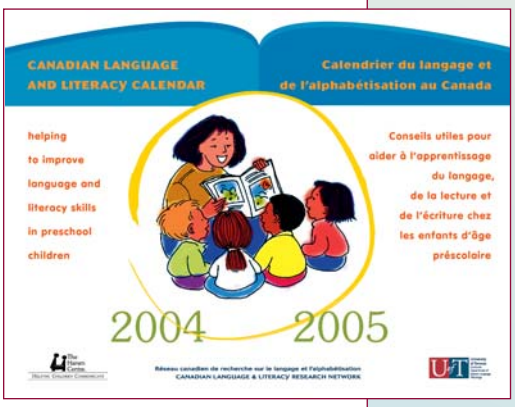
Sustainable Forest Management Network: Reference book "not just for academics"

The Sustainable Forest Management Network has transformed seven years of research into a comprehensive resource that could lead to better management practices for boreal forests around the world. *Towards Sustainable Management of the Boreal Forest* is written for forest managers, professionals concerned with forest policy issues, resource managers, private-sector companies working in the forest sector, and Aboriginal communities—in essence, all of the Network's partners.



"Sales in North America topped 1,400 in the first year, and in many jurisdictions—such as the United States and Scandinavia—we're seeing general recognition of the benefits of solutions that promote environmental conservation simultaneously with promoting economic efficiencies," says Dr. Philip J. Burton, one of the book's editors.

Canadian Language and Literacy Research Network: Reading, writing and economic prosperity



The Canadian Language and Literacy Research Network has distributed 45,000 calendars to early educators to help them help preschoolers improve language and literacy skills. The bilingual calendar translates cutting-edge scientific findings into fun, practical activities that can be used in the classroom.

Helping children overcome obstacles to reading can boost Canada's economic prosperity. The proof is in the numbers.

A recent Statistics Canada survey shows that increases in literacy levels correlate directly with increased labour productivity and a stronger GDP.

"An investment (in literacy) increases the skill level of an average worker," says Dan Sinai, Managing Director of the Canadian Language and Literacy Research Network. "And if you increase that level, you are looking at a permanent growth of GDP."

The NCE's only pure social science network is using evidence-based science to improve literacy levels. It is also focusing on putting the results of that research into practice. Toronto Star reporter Peter Calamai, a longtime literacy crusader who sits on the Network's board, describes this as an ongoing challenge.

"If you're doing work in photonic devices, there will be guys standing outside the research lab willing to grab the first piece of stuff you have and commercialize it. But in literacy, we know there are real problems in translating the research into practical applications."

Mr. Sinai says this is his network's raison d'être. "We broker the transfer between the research environment and the world that makes policy, delivers programs and provides early childhood education."

Fiscal Year 2003-2004

Patents, licences and spin-off companies

Patents	Filed: 105 Issued: 31
Licences	Granted: 19 Under negotiation: 30
Publications	Refereed publications: 3,564 Non-refereed publications: 993

Spin-Off Companies: 11

Name	Network	City	Province
Arthritis Consumer Experts	CAN	Vancouver	BC
Canadian Rheumatology Research Consortium	CAN	Toronto	ON
Cutting Edge Medical Systems	CIPI	Toronto	ON
Molecular Printing Press	CIPI	Toronto	ON
NoNO Inc.	CSN	Toronto	ON
Geotango	GEOIDE	Toronto	ON
Sim Active	GEOIDE	Montreal	QC
Sim Tech	GEOIDE	Quebec	QC
9138-2408 Quebec Inc.	IRIS	Quebec	QC
FastTrack Technologies	MITACS	Edmonton	AB
Coragen	SCN	London	ON

Advanced Foods and Materials Network: Getting from concept to consumer

McGill University law professor Dr. Richard Gold and his colleagues are developing a framework to guide researchers with the Advanced Foods and Materials Network through the highly detailed commercialization process. By having appropriate intellectual property policies in place, researchers will know which technologies they're allowed to use in their own research.

"While our research results will not themselves have commercial potential, we hope they'll assist researchers, industry and government at all levels in developing sound and sustainable intellectual property laws and narrowing research funding gaps."

Gold is collaborating with McGill graduate student Karen Durell and Profs. Peter Phillips, Department of Agricultural Economics, University of Saskatchewan; Tim Caulfield, Health Law Institute, University of Alberta; and David Castle, Department of Philosophy, University of Guelph.

From BSE to Climate Change

Researchers pool talent to tackle the tough issues

By Debbie Lawes

Canada has become quite adept at building networks of scientific excellence to respond to issues that threaten our health, economy, environment and even national sovereignty. When a crisis hits, Canada's scientific community mobilizes into national networks to find answers to tough questions.

The spring 2003 SARS outbreak proved just how essential coordinated research and networks are to Canada. Researchers from three networks mobilized quickly to study this little-known virus—its make-up, how it spreads and what can be done to protect humans from contracting it.

The Protein Engineering Network (PENCE) was one of the first out of the block. Once researchers in British Columbia had discovered the genomic sequence of the SARS coronavirus, PENCE immediately coordinated research into the proteins that determine its characteristics. Meanwhile, the Canadian Network for Vaccines and Immunotherapeutics (CANVAC) began working with researchers across Canada and internationally in hopes of developing a SARS vaccine, following the same approach that led to inoculations against hepatitis, chicken pox, polio and other diseases.

But it wasn't only medical scientists who took up the call to combat this deadly disease. At Mathematics of Information Technology and Complex Systems (MITACS), researchers from across Canada are using mathematics, statistics and computer science to identify the best way to stop SARS from spreading. They are studying data gathered from cities where large numbers of people became infected with SARS to develop mathematical models based on actual transmission patterns.

PENCE, CANVAC and MITACS are also members of the Canadian SARS Research Consortium, a public-private sector partnership to promote and coordinate research into SARS and emerging new pathogens.

An NCE for BSE

SARS isn't the only virus that demands a coordinated response from the research community.

In March 2004, the federal government announced $5 million for the establishment of a new NCE that would study bovine spongiform encephalopathy or mad cow disease and related prion diseases. The competition will begin in 2005.

Dr. Rickey Yada at the University of Guelph is AFMnet's Scientific Director and a driving force behind its creation.

Getting the facts on advanced foods and materials

The Advanced Foods and Materials Network (AFMnet) is striving to develop novel ideas in food safety, nutritional quality and human health.

Launched last year, this NCE brings together natural scientists, engineers, health researchers, social scientists and lawyers to work within three research themes: Structure, Dynamics and Function of Food and Bio-Materials; Functional Foods and Nutraceuticals; and Genetics, Ethics, Economics, Environment, Law and Society.

"The Network will provide the public with a credible source of information and advice on issues of food safety, while examining opportunities for new materials arising from new biological processes," says NCE Steering Committee Chair Dr. Tom Brzustowski.

Potential research outcomes include the production of non-latex rubber, better dressings for wounds, improved food quality, improved food safety, and higher public confidence in the food supply.

Three of Canada's longstanding health-related NCE—PENCE, the Canadian Bacterial Diseases Network and the Canadian Genetic Diseases Network—were among those who championed the idea for a new national network in this field. So did Dr. Robert Church, the former chair of the Alberta Science and Research Authority.

"We have three senior networks that have developed world-class infrastructure and networks across this country. They're a huge success story for Canada. We also have several federal research groups. We need cross-cutting disciplines and we need them to be competitive. Prions are an emerging area of research and like SARS, it's cross-species. We have expertise in this area," Dr. Church stated in an April 6, 2004, RE$EARCH MONEY article.

PENCE's Scientific Director, Dr. Steve Withers, says the new network could also address the continuation of the three networks beyond their 14-year mandates.

Protecting National Sovereignty

Prime Minister Paul Martin stressed in his October 6 response to the Speech from the Throne that: "let there be no doubt: we will protect our sovereignty in the Arctic."

The ArcticNet NCE is striving to help Canada meet that commitment.

Scientists predict that melting ice in the Northwest Passage could open it up for international shipping within 15 years, creating security and sovereignty concerns for Canada.

In one ArcticNet project, a team of Canadian and U.S. researchers will map the topography of the sea floor and geological structure of the Northwest Passage and other regions of the Canadian Archipelago as a first step towards the management of increased intercontinental ship traffic and resource exploration. The project will contribute invaluable information to assess the economic, sovereignty and security implications of an ice-free Northwest Passage. — NCE

Helping allergy sufferers

Help is on the way for the more than one-third of Canadians who suffer from allergies.

Launched Nov. 5, the new Allergy, Genes and Environment Network (AllerGen) will coordinate activities of top Canadian researchers, physicians, healthcare providers and groups representing allergic disease sufferers—in partnership with leading drug, food and biotechnology companies, institutes, school boards, workers' groups and government agencies. More than 120 academic researchers and collaborators located at 14 Canadian universities, and more than 50 Canadian and international partners, will be involved in the new network.

Research will focus on the development of new genetic and other medical diagnostic tests, better medications, and environmental, health and workplace safety policies, as well as improved care for allergic disease sufferers.

Dr. Judah Denburg, Director of Clinical Immunology and Allergy at McMaster University, will serve as Scientific Director.

AllerGen will also address the dire shortage of allergists and allergic disease researchers in Canada, offering new positions for more than 100 research trainees, and doubling the number of highly qualified Canadian clinical specialists and research scientists produced in this field each year.

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Global Connections

The NCE Model Goes Global

IT MAY HAVE STARTED AS A CANADIAN VISION, BUT THE GOAL OF CONNECTING RESEARCHERS, GOVERNMENT AND INDUSTRY TO ACHIEVE CRITICAL MASS IS BECOMING THE GLOBAL NORM.

By Kathie Lynas

From the European Union to Australia, a growing number of countries are forming centres of scientific excellence that are similar to what Canada put in place 15 years ago with the Networks of Centres of Excellence program.

"When you look at the trends today, you realize that the NCE model was in many ways ahead of its time," says Dr. Verna Skanes, Chair of the NCE Selection Committee in 2003 and 2005. Now, 15 years later, the global research community recognizes that "large-group science" funding partnerships and a focus on knowledge transfer are the fast track to progress.

Photo: ArcticNet

Canada is a key player in this virtual, trans-border research community. In just five years, the NCE has seen its list of international partners grow from 208 in 1999-2000 to a high of 1,684 international partners in 2003-04.

The NCE model is both admired and emulated internationally. NCE Director Jean-Claude Gavrel says EU countries have sought advice from the NCE on best practices as they move forward with their Sixth EU Framework Programme for Research and Technological Development.

The NCE's success at home is believed to be one reason why international researchers are interested in partnering with Canadian NCE. In its 2002 review of the NCE program, KPMG noted: "The NCE creates internationally known centres of expertise. Even with the relatively limited total funding Canada can provide for research, the country is in the ballgame internationally in selected areas, both in terms of research and in industrial receptor capability."

The NCE is a strong selling point when trying to attract international research partners for Canada, according to Thierry Weissenburger, Counsellor (Commercial) at the Canadian Embassy in Denmark and Canada's Nordic Countries S&T Coordinator.

"For practitioners like us it is very convenient. It provides a single point of entry into Canada's science and technology system," he says. "You can connect foreign researchers with a specific scientific director through the NCE and know there is a very good chance that you are tapping into the essential expertise in a given area."

From Global Warming to Aquaculture

Several networks are active participants in international research projects. For example, through ArcticNet, Canadian university and government researchers are linked with colleagues from the U.S., Japan, Denmark, Poland, Sweden, Norway, the U.K., Spain and Belgium. Working on board the Canadian research icebreaker *Amundsen*, this multinational, multi-disciplinary team is studying the impact of global warming on the oceans, the ecosystems and the people living in Canada's most remote northern regions.

ArcticNet is also leading an initiative with colleagues in Greenland, Alaska and Siberia to develop an international longitudinal study that would assess the impacts of dietary and environmental changes on cardiovascular disease, cancer and diabetes in Inuit populations around the world.

Another NCE, AquaNet, has forged a partnership between Canadian university researchers and graduate students and Fiskeriforskning, a world-class Norwegian aquaculture research institute. The goal is to determine whether sea lice from farmed salmon are infecting wild salmon and to potentially develop new scientific strategies to mitigate the risk.

AquaNet is also the only non-European partner participating in the world's largest aquaculture project. SEAFOODplus is studying the effects of husbandry and aquaculture systems on seafood quality.

Expansion of these international links is "definitely where we want to go," says Mr. Gavrel. For example, the Europeans launched a network of excellence on bovine spongiform encephalopathy (mad cow disease) research in May of 2004. The NCE will soon issue a call for proposals for a Canadian BSE network, with a proviso that it be linked to the European network.

"Let's extend the model," says Gavrel. "Why do research here that is being duplicated elsewhere? When we are talking about human and social benefits, in particular, we all want the same things." — NCE

Kathie Lynas is an Ottawa-based writer and communications consultant.

CANVAC takes lead on SARS

The Canadian Network for Vaccines and Immunotherapeutics' strong international linkages led to last year's discovery of a hormone that puts the world one step closer to developing a vaccine against Severe Acute Respiratory Syndrome (SARS).

A team of international scientists, led by CANVAC researcher Dr. David Kelvin, found that people infected with SARS have high levels of a hormone called IP-10, a key immune factor in the blood. This discovery could help frontline workers better screen for the disease, and over time, lead to the development of a SARS vaccine.

The project brought together funding agencies from across Canada, including CANVAC, Genome Canada and the Canadian Institutes of Health Research, as well as researchers from around the world.

"We were able to reach out to scientists in cities in Taiwan, Singapore and China—epicentres of the disease—and share clinical information," says Dr. Kelvin, who heads the Division of Experimental Therapeutics at the University Health Network in Toronto. "And when we started work on developing a vaccine, the CANVAC network allowed us to collaborate with corporate pharmaceutical partners in Europe."

Dr. Kelvin says international networking is essential when responding to emergencies such as HIV/AIDS and SARS, as well as the inevitable outbreaks of deadly new diseases in the future.

Conserving the planet's boreal forests

Through the power of international collaboration, Canada and other nations are working together to balance industrial development with protection of biodiversity in their great northern forests. Canada's Sustainable Forest Management Network linked with Sweden, Finland and Russia in 1999 to form the international network of BorNet, which is increasing the world's knowledge of the conservation of biological diversity in boreal forests—the forests of hardy coniferous and deciduous trees that span the circumpolar region.

"We have been working in our boreal forests for a much shorter period of time and we're gathering expertise from people who have been developing their forests for 300 years," says Bruce Macnab, a research administrator with the network at the University of Alberta in Edmonton. "They have lost some biodiversity that they want to get back and they can learn from us. At the same time, we want to learn from them, so that we can conserve our boreal resource."

In 2004, BorNet countries were seeking increased involvement with Russia and other boreal nations.

"AquaNet is a natural partner for us. There are many similarities between Norwegian and Canadian aquaculture, in terms of our science and our industries. As relatively small countries, we can strengthen our contribution at the international level by working together."

Dr. Ivan Burkow, Managing Director

Fiskeriforskning Research Institute, Norway

BUILDING a Stronger Canada

Where to from here?

By Debbie Lawes

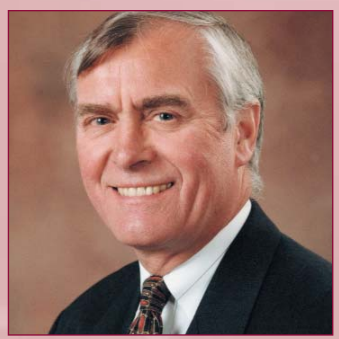
Better health care, sustainable development, strong economic growth and a more civil society. These are complex issues that are pushing the frontiers of science and public policy in a 21st century Canada.

As the Networks of Centres of Excellence reflect upon the accomplishments of the past 15 years, ideas abound on how this nation-wide program should evolve to meet the changing needs of an increasingly integrated and global society. Experts agree the NCE continues to be a necessary catalyst in helping to bridge the gap between research and results. Many cautioned against changing what has been described as a "winning formula."

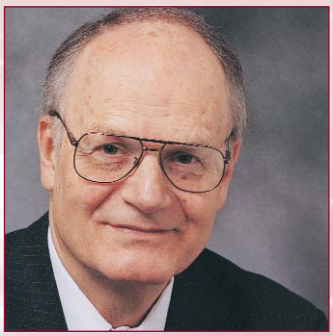
They also insist that more can be done to make the NCE a more effective national program. Here's what they suggest:

Go Global

Dr. Arthur Carty, National Science Advisor: "Everything we're seeing around the world with globalization points to interconnectedness, relationships with other countries, and building capacity in research and development by collaborating with others. This suggests to me that we have to reach out more than we've done so in the past. An international NCE network would probably be very helpful to Canada at this point in time."



More Networks, More Results



Dr. Tom Brzustowski, Chair, NCE Steering Committee; President, NSERC: "I would like to see more networks, more new groupings of research talent to address emerging issues as well as emerging opportunities for Canada, and a good balance of targeted and untargeted competitions. In that context, I would like to see NCE money spent in such a way that the greatest possible amount of positive qualitative change is produced in Canada's capacity for research, and for putting research results to use."

Strengthening the **Social Sciences & Humanities**

Dr. Marc Renaud, NCE Steering Committee; President, SSHRC: "We need human science research networks that address the wickedly complex issues of our times, such as economic equity, wealth creation and redistribution, evidence-based decision-making, the Western-Islamic divide, racial and ethnic discrimination, environmental sustainability, ethics and reproductive technologies, corporate governance, balancing of work and family, etc. After all, what we have learnt with September 11th 2001 is that the lasting antidote to terrorism is a continually renewed understanding of the complex world we live in. We need networks that create a civil society."

Enhancing **Technology Transfer**

Dr. Martha Piper, President, University of British Columbia: "We must continue to aggressively commercialize our research discoveries. We already have some good templates. For example, the Stem Cell Network's commercial collaboration and the Canadian Stem Cell Co. have brought universities and the private sector into a promising working relationship."

Tell a Journalist

Peter Calamai, National Science Reporter, Toronto Star: "Every once in a while I stumble across a subject like biological control, and then I discover that an NCE has been behind it for five years. I didn't know anything about it, yet I am bombarded by American institutions with their stories. I have to know about these things… It's about making themselves relevant to the taxpayers by making themselves relevant to the news of the day."

Helping Partners Come **Aboard**

Jean-Claude Gavrel, Director, NCE: "I would like to see a program that does even more to transcend the silos of industry, university and government. Right now, we're asking a lot from industry and government labs when they participate in an NCE. But really what we want to achieve with an NCE is a common goal with participation of all these partners. We will have a better chance if all these people have better resources to go in that direction. You need incentives that will help them to participate."

Management is Key

Dr. Martin Godbout, President, Genome Canada: "I would put management as an even more important selection criteria for future NCE. Those that work have good management."

Is 14 Years Enough?

Dr. Claudine Simson, Chair, Micronet; VP Freescale Semiconductor: "My biggest concern with the NCE program is the sunset clause. If the research continues to be excellent and the network continues to produce well-trained professionals, and the funding from industry is still going up, there's no reason to end it if the benefits keep coming to the country."

Pooling Patents

Dr. Peter Morand, President/CEO, Canadian Science and Technology Growth Fund: "If the networks pool their intellectual property, the whole becomes a much stronger entity, meaning you can compete better with some of the much larger organizations that exist in the U.S. and Europe. If nothing else, the networks have to address the issue of IP, the management of it and the interface with the universities."
— NCE

Did You Know?

Research by the Canadian Institute for Photonic Innovations in sub-femtosecond optical and electron pulses was recognized as one of the 10 **most important** scientific advances in the **world** for 2002 by scientific magazines *Science* and *Nature*.

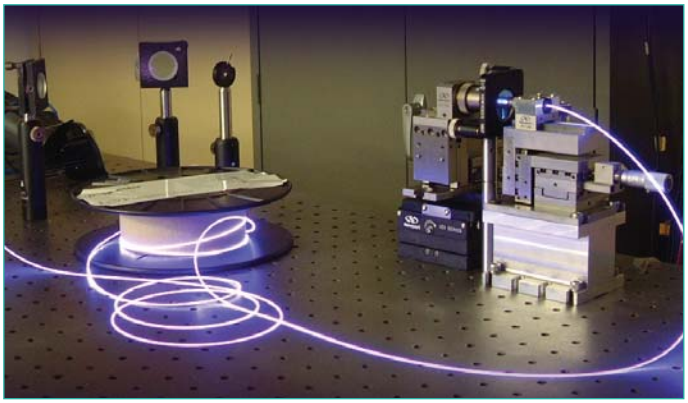


Photo: CIPI

"Excellence…" continued from page 6

Raising the Bar for Science

Dr. Verna Skanes

Dr. Verna Skanes, a former Professor of immunology at Memorial University, says there's no doubt the NCE was ahead of its time. She recently completed a report for a health sector client that identified trends in research funding among granting agencies in Canada and abroad. Among her findings: research partnerships are becoming the norm, and "large-group science" is accelerating progress.

"If you look at the Medical Research Council in the U.K., for example, the talk is about integrative biology, meaning the biological questions are only going to be answered through multidisciplinary work because the problems we're left with are the complex ones," says Dr. Skanes, who chaired the NCE's 2003 and 2005 selection committees. "That's one aspect that now seems to be dominating the whole funding world, and the NCE has been there for quite a while."

She also credits the NCE for breaking new ground in technology transfer and student training, saying these objectives have since been adopted by international and national health agencies. "In my list, it came down to most of the same points that the NCE has been making for some time in its mission."

For Dr. Claudine Simson, coordinated research and industry-relevant training are two of the NCE's greatest accomplishments. She has been an ardent vocal proponent of the need for more highly qualified workers to support Canada's information and communications technology industries. Each year, the NCE contributes to the development of more than 6,500 highly qualified professionals, including researchers, research associates, post-doctoral fellows, graduate and summer students, as well as technicians.

"There was real interest among industry for an NCE program, particularly within the semiconductor industry," says Dr. Simson, a former Nortel Networks executive who is now Vice-President and Chief Technology Officer at Freescale Semiconductor in Austin, Texas. She is also a member of two NCE boards, MITACS and Micronet. "By coordinating the research thrust among universities, and in partnership with industry, you build critical mass, avoid duplication, share costs and distribute all the knowledge that you gain out of the program."

NCE Director Jean-Claude Gavrel points out that partnerships are not limited to industry. Increasingly, they encompass associations, municipalities, provincial governments, research foundations, patients and Aboriginal groups, among others. The Canadian Arthritis Network, for example, has formed a Consumer Advisory Council that strives to create closer links between the scientists who conduct the research and the people it is intended to help.

"Having broad participation from the groups who use this new knowledge increases the likelihood of it being applied in areas where it is most needed," says Mr. Gavrel.

"The NCE has created a more multidisciplinary and holistic approach to bringing the practical results of research to Canadians. The growing integration of the social sciences with the natural sciences fostered by the NCE is particularly noteworthy, as it allows us to look at problems in their full physical, social and human context."

Dr. Marc Renaud
President, SSHRC

The NCE: A Model for Others

Ideas that started with the NCE more than 15 years ago are now commonplace within the larger research landscape. Concepts such as multi-disciplinary research, leveraged financing, knowledge transfer and partnerships have been embraced by Canada's granting councils and newer organizations, such as the CFI and Genome Canada.

"These approaches have now been modeled way beyond the Networks of Centres of Excellence," says Dr. Evans. "If you look at CFI with expensive infrastructure, there have been strong guidelines to show how other institutions can benefit from the use of this infrastructure. It's about getting the maximum power out of your research investment."

The NCE also provided a template for the transformation of the Medical Research Council into the Canadian Institutes of Health Research. CIHR's institutes share many similarities to the NCE, including a multi-disciplinary approach to research and a focus on putting research results into practice.

"Early on, the NCE demonstrated to the research community and funders that fruitful cross-national collaborations were possible, which set the stage for the creation of CIHR's 13 virtual institutes," says Dr. Alan Bernstein, President of CIHR and a member of the NCE Steering Committee. "Today, NCE and CIHR institutes work collaboratively to advance health research and results in several areas, including stroke training, SARS research and safe driving."

Dr. Alan Bernstein

Learning how to work within a network has also paid dividends. Dr. Godbout says researchers and universities who participate in an NCE gain valuable experience in working with each other and with the private sector within a virtual network. It's a coveted skill that subsequent research organizations have benefited from, including Genome Canada.

"We would not have succeeded at Genome Canada if we had not had several scientists who had been part of pre-existing Networks of Centres of Excellence," he says, adding that the NCE experience has also equipped Canadian scientists to lead international projects.

"At Genome Canada, we have scientists working with not only universities in Canada, but with universities around the world. The NCE experience had made Canada quite successful in leading these international consortia and in bringing other countries on board."

Did You Know?

Prior to AUTO21's establishment in **2001**, the number of automotive researchers at Canadian universities was relatively small. Now, more than 250 researchers and 350 students participate in collaborative research with the **top automotive companies** in Canada's biggest industry sector.

Exploring New Frontiers

Everyone interviewed for this article agreed that the NCE is as relevant today as when it was established 15 years ago. Canada's National Science Advisor to the Prime Minister went even further by suggesting that "the NCE is probably *more* relevant now than when it was created."

"The idea at that time was to help build up critical mass in key areas of strategic importance to Canada," says Dr. Arthur Carty. "Since then, we've seen a much greater emphasis on helping to solve problems by bringing people together from various fields, domains and disciplines. Therefore the need for multi-disciplinary skills, the need to bring people together from disciplines to look at and tackle problems, is stronger than it's ever been."

Those multidisciplinary skills have increasingly included participation from the social sciences and humanities. For example, the recently launched ArcticNet network has natural scientists working with epidemiologists, sociologists and economists to examine the impacts of climate change on the environment, resource development, Aboriginal health, northern economies and even Canadian sovereignty.

"Climate change is having a huge impact on the Arctic, and it is essential to explore the consequences of this dramatic change, not only on the fragile environment, but also on the people who live there," says Dr. Marc Renaud, a member of the NCE Steering Committee and President of SSHRC. "This essential research will help ensure the sound stewardship of a rapidly changing Canadian Arctic."

Another NCE, the Sustainable Forest Management Network, brings together a cross-Canada team of experts from economics, social sciences, engineering, biology, ecology, and geography to produce scientific results that improve our understanding and management of the nation's forests. ❀

Dr. Linda Phillips (right) is the lead investigator on a Canadian Language and Literacy Research Network project studying the efficacy of a family literacy program offered to preschoolers and their parents in Alberta.

continued from page 29

The Canadian Language and Literacy Research Network is unique in that it is the only pure social sciences-based NCE. Its greatest challenge, says one of its board members, is not in studying what works and what doesn't work in literacy—it's about putting the research results we already have into practice.

"That means working very closely with all elements, right from provincial ministries of education, to principals, to teachers, to school boards, and to parent groups, to demonstrate that this research is effective," says Dr. Lewis Slotin, President and Chief Operating Officer of MedTech Partners of Ottawa.

The President of the University of British Columbia sees an even stronger role for the social sciences and humanities if Canada is to effectively respond to the complex challenges of the 21st century. Dr. Martha Piper says this requires an even greater integration of the social sciences with the natural and health sciences, as well as new multidisciplinary networks dealing with issues such as justice, drug addiction and the poverty cycle in Canadian society.

"If you think about the things that Canadians worry about, they are all social sciences issues," she says. "And these issues can be as difficult to society as finding a cure for cancer."

The NCE: "As relevant today as ever before"

Fifteen years after its inception, the NCE program continues to be recognized as a model for scientific collaboration and knowledge transfer. As Dr. Smith observes, the NCE was born out of necessity and ingenuity, and the societal, economic and geographical imperatives for its creation are as relevant today as ever before.

"That issue of critical mass is never going away. If people cannot get the money to work with one another from a distance, we'd be back where we were 15 years ago. The NCE was an experiment that has evolved into an established program that is constantly held up, both within Canada and internationally, as a way of doing research. Why would we change that?" — NCE

Debbie Lawes is President of Dovercourt Editorial Services, Editor of Canada Research Horizons and Consulting Editor to RE$EARCH MONEY.

"In some areas, knowledge does have a commercial value and will end up in a commercial product. In other areas, largely the social sciences and humanities, that knowledge transfer may end up in a policy, or in contributing to peace, tolerance, a more civil society, a better immigration policy, a better system for First Nations people, or a better education system… That to me is just as important as what product was created."

Dr. Martha Piper

President, University of British Columbia