

NRC · CNRC

*From Discovery to Innovation...*

OUTSTANDING PEOPLE

creativity

Talent for Canada



National Research  
Council Canada

Conseil national  
de recherches Canada

Canada

## NRC VISION

Recognized globally for research and innovation, NRC is a leader in the development of an innovative, knowledge-based economy for Canada through science and technology.

This Vision is founded on five strategic pillars:

### Outstanding People – Outstanding Employer

Recognition as a leading research organization distinguished by creativity and innovation

### Excellence and Leadership in R&D

Integration of public and private strengths to create new opportunities and meet national challenges for Canada

### Technology Clusters

Development of the innovative capacity and socio-economic potential of Canada's communities

### Value for Canada

Commitment to the creation of new technology-based enterprises, technology transfer and knowledge dissemination to industry

### Global Reach

Access to world-class science facilities, as well as global research and information networks. Stimulation of enhanced international opportunities for Canadian firms and technologies.

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**Cover photo:** *Researcher from the NRC Institute for Marine Biosciences (NRC-IMB) examining postlarval sea scallops at the NRC-IMB aquaculture research station, Sandy Cove, Nova Scotia.*

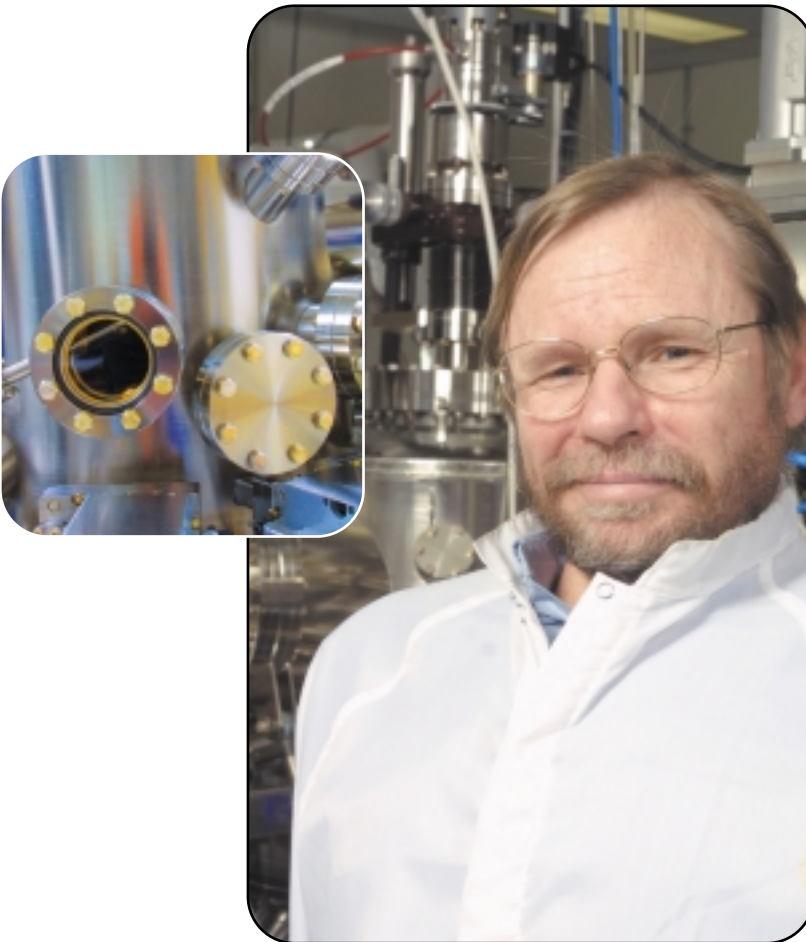
**"NRC is a leading research organization distinguished by creativity and innovation  
– a great place to work where outstanding people can make outstanding  
contributions to Canadian innovation." – NRC Vision 2006**

# Talent for Canada

## **Outstanding People – Outstanding Employer**

Great people. Great minds. NRC's success lies with the nearly 4,000 dedicated, knowledgeable, creative and talented men and women that give the organization life. Over NRC's 85-year history, its people have earned an international reputation for excellence in leading-edge research and development and innovation – they hold the highest regard of peers, colleagues and collaborators in a wide range of science and engineering domains.

The list of these accomplishments continued to grow in 2002–2003, reinforcing the reputation for excellence enjoyed by NRC staff in their respective fields. They received: major awards across a broad range of scientific sectors; took on the development and leadership of numerous workshops (185 in 2002–2003); participated and led numerous





# creativity

**“Imagination is more important than knowledge.”**

– Albert Einstein



national and international committees; participated as adjunct professors at post-secondary institutions (318 professorships); held the editorships of a broad range of scientific journals (161); delivered invited presentations (1,168); and published thousands of papers. This influence demonstrates excellence but, more importantly, it helps attract and stimulate further excellence. Those who are the best want to work with people recognized by their peers as being the best.

## **Recruitment**

World-leading science and life-altering discoveries begin with world-leading people. In 2002–2003, NRC launched a major recruitment effort called New Horizons, New Opportunities. Its goal

is to recruit 50 outstanding researchers to NRC within the next five years. The initiative specifically targets outstanding young scientists and engineers with the potential to become world leaders in their field, as well as established world-renowned researchers. NRC is helping to ensure Canada has enough highly qualified people with the skills and knowledge to make a real impact in key domains and help Canada achieve its global R&D and innovation performance targets.

## **At a Glance, 2002–2003**

Over the past year, NRC has taken important steps towards putting its **Employment Philosophy** into action. One of the foundations of the *NRC Vision 2006* is NRC's commitment to being a home for the best of the best in science and engineering. It has given life to this commitment through an **Employment Philosophy**, a detailed commitment to being an **Outstanding Employer of Outstanding People**. Recent achievements include:

- Development of a new Leadership Management Development Program and Management Orientation Program
- Development of a Human Resources Management Framework for NRC that will allow managers to assess their performance against a standard that reflects the leadership and management goals of the organization
- Completion of Phase One of a hiring process modernization effort
- Improved tracking of participants in NRC student and post-doctoral programs to ensure availability for future recruitment opportunities

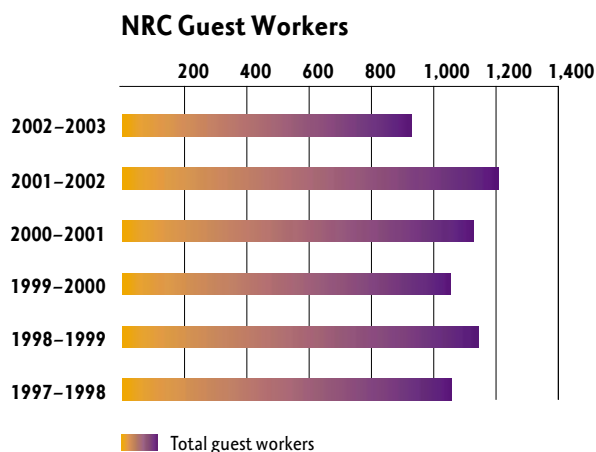


Award programs such as the Herzberg Memorial Prize and Fellowship allow NRC to attract the world's best. Dr. Marek Potemski, prize winner for 2002–2003, is a research director at France's Centre national de la recherche scientifique and Head of the Semiconductor Group at the High Magnetic Field Laboratory in Grenoble, France. Recognized for his work in semiconductor nanostructures, Dr. Potemski will spend a one-year fellowship with the NRC Institute for Microstructural Sciences working in the area of spintronics.

participation of these skilled workers in collaborative projects, their home organizations gain equally from the training provided and the transfer of knowledge and know-how from NRC.

## Contributing to Canada's Skilled Workforce – Student Programs

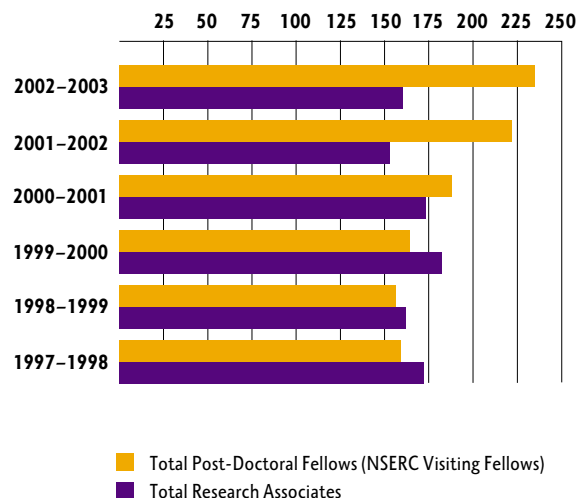
Today's knowledge economy demands a well-educated and skilled workforce. NRC helps meet this need, not only through its own recruitment and training activities, but also



## Guest Workers

NRC institutes, technology and innovation centre engaged 927 guest workers from Canadian and foreign universities, companies and public and private sector organizations. These researchers are a fundamental element of NRC's partnership and collaborative network development efforts, engaging industry, universities and government in Canada and around the world. Not only does NRC benefit from the

## NRC Post-Doctoral Fellows and Research Associates



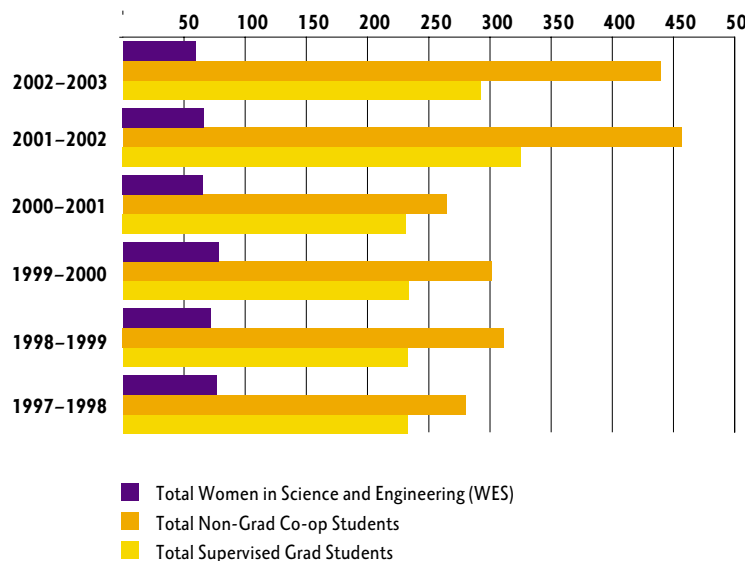
**"I think that the WES program is one of the best educational/career experiences I could have had. Not only do I gain valuable lab experience, but I get to meet inspirational supervisors and valuable contacts. It is a great program to be involved in, with up-to-date labs, brilliant investigators, and great pay for a summer of learning." – WES participant Amy Robinson**

as a partner with other government agencies and universities – in Canada and abroad.

For many, NRC offers a unique developmental opportunity. NRC provides a wide range of programs designed to create challenging work opportunities for all levels, from undergraduates working in summer programs and co-op placements, to graduate students and post-doctoral fellows. In 2002–2003, NRC student programs provided direct, hands-on training and development work for some 731 graduate, co-op and summer students, and 239 post-doctoral fellows (PDFs).



**NRC Student Programs**



### Women in Engineering and Science

NRC's Women in Engineering and Science Program matches promising students with world-class researchers and facilities. It provides summer and co-op work placements for women pursuing undergraduate studies in science, engineering or mathematics. The purpose of the program is to encourage talented female students to pursue professional careers in science and engineering fields, professions where women continue to be underrepresented.

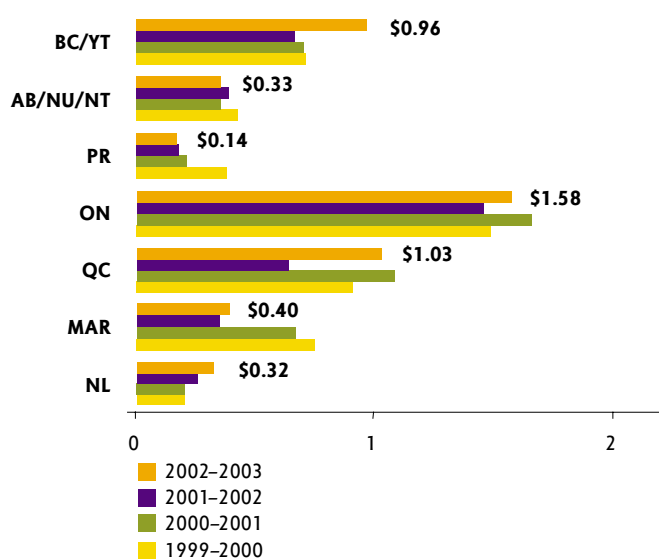
WES students contribute to leading-edge research projects and gain valuable laboratory experience in the process. In turn, NRC is enriched by the contributions of these promising young students and gains the opportunity to help round out the education of up-and-coming women science and engineering professionals.



In 2002–2003, NRC awarded 25 new WES scholarships. This year's recipients join hundreds of WES alumni who have benefited from the program since 1989.

There are currently 65 students in the program working in placements at NRC's national network of research institutes.

**NRC-IRAP Youth Employment Initiatives  
Regional Investments from 1999–2000 to  
2002–2003 (\$ M)**



### **Supporting Federal Youth Employment Initiatives**

To help SMEs meet demand for highly qualified personnel, NRC-IRAP manages two youth internship programs on behalf of Human Resources Development Canada. In 2002–2003, a total of 568 graduates were placed in 448 SMEs across Canada. Total contributions to firms amounted to \$4.76 million. Of these contributions, more than \$4.6 million was invested in the Science and Technology Internships Program supporting 553 recent graduates working in 437 firms. The remainder was invested in the Science Collaborative Research Internships Program to support nine graduates in collaborative projects with SMEs in British Columbia, Manitoba and Ontario.



## **Contributing to Canada's Skilled Workforce – Industry and Partner Programs**

Collectively, NRC institutes and programs offer a number of training and outreach efforts to engage industry, educators, other levels of government and international partners. This training helps meet Canada's need for a specialized workforce.

### **NRC Institute for Research in Construction Seminar Series –**

In 2002–2003, NRC-IRC relaunched its Building Science Insight seminars across Canada, focusing on new research findings in the areas of sound insulation and fire containment. The team delivered full-day seminars with extensive supporting material to 800 industry practitioners (in English and in French) at 17 sites spanning all 10 provinces and the three territories. Audiences grew steadily throughout the series, with sold-out rooms at several sites in November, and high ratings from participants.

**MR Training Program** – The NRC Institute for Biodiagnostics (NRC-IBD) continued to train students in the joint NRC-IBD/Red River College Magnetic Resonance Technology Training Program. Twelve students graduated from the program last year; all have successfully found employment at hospitals throughout Canada. In total, 120 students have graduated from the program. Red River College students in the Animal Health Technician Program are also trained at NRC-IBD as part of their practicum.

**Biomanufacturing Curriculum** – The NRC Biotechnology Research Institute devoted considerable time in collaboration with DSM Biologics, Emploi-Québec and various CEGEPs in Quebec to help increase the quality and number of technicians and process operators in the emerging biomanufacturing industry in Quebec and in Canada.



The new NRC Canadian Photonics Fabrication Centre will have a significant educational component and will be able to offer on-site classes and hands-on training to graduate students employed at the NRC Institute for Microstructural Sciences.



### **NRC Institute for National Measurement Standards Metrology Courses**

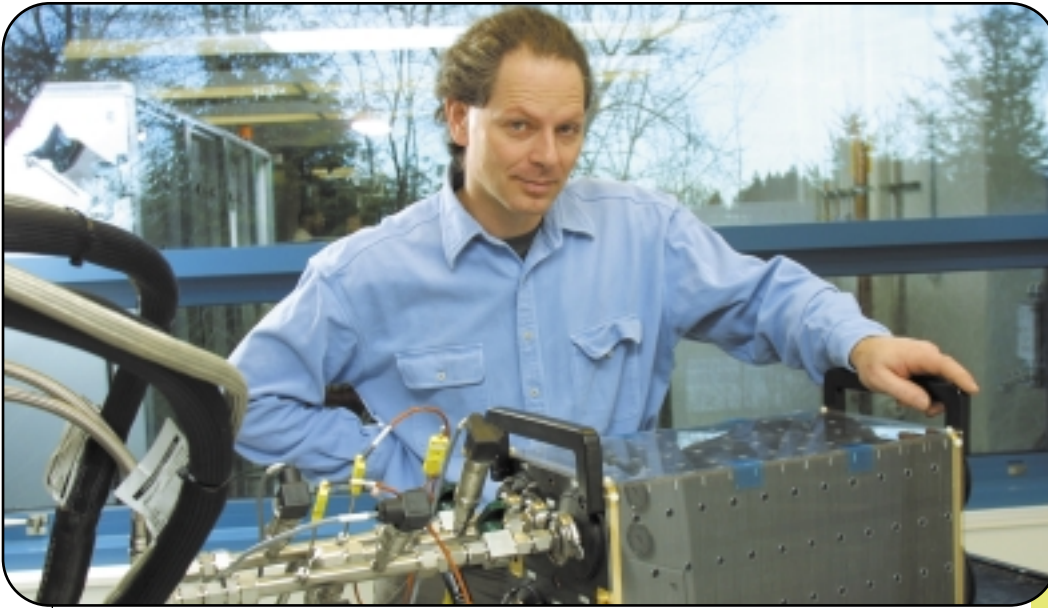
– The absence of metrology programs at Canadian universities means that the majority of metrologists are trained “on the job.” This is particularly true for SMEs, where investment in metrological specialization is difficult because of their limited workforce and capacity. NRC-INMS has responded by organizing and delivering external

conferences and seminars on the measurement of basic physical quantities and the application of metrology. In 2002–2003, NRC-INMS held courses in: Monte Carlo Radiotherapy BEAM Simulation Software; Radiation Transport Calculations using EGSnrc Monte Carlo System; and Photometry, Radiometry, Colorimetry. The courses attracted Canadian and foreign students from the private, public and health-care sectors.

“Science is not formal logic – it needs the free play of the mind in as great a degree as any other creative art. It is true that this is a gift which can hardly be taught, but its growth can be encouraged in those who already possess it.” – *Nobel Laureate Max Born*



***NRC-SIMS Summer School***



**Alan Storey, Artist in Residence**

### **NRC Steacie Institute for Molecular Sciences Summer School**

– The NRC-SIMS Neutron Program for Materials Research held a week-long summer school at Chalk River Laboratories. The course covered the basic concepts of neutron scattering as well as many specific techniques and areas of application. There were also hands-on neutron scattering experiments, conducted at the NRU (National Research Universal research) reactor. Lecturers from NRC, Queen's and McMaster Universities, as well as the UK and USA, compiled a curriculum. The class of 28 came from eight Canadian universities as well as institutions in Japan, France, South Korea, the UK and the USA.

### **NRC Industrial Research Assistance Program**

#### **Workshop Series**

– NRC-IRAP developed a series of Lean Product and Process Design workshops for SMEs to present methods for reducing waste, increasing speed and efficiency in processes and designing products for high-margin, sustainable manufacturing. Workshops were held in Vancouver, Edmonton, Winnipeg, Toronto and St. John's for some 150 participants.

### **Towards a Creative and Innovative Future**

Artists Alan Storey (visual arts) and Catherine Richards (media arts) are the first recipients of two fellowships of \$75,000 per year from the Artists-in-Residence for Research (AIRes) program, jointly established by the Canada Council for the Arts and NRC. AIRes is part of a broader Memorandum of Understanding signed with the Canada Council. These fellowships will provide the artists with a two-year research residency in one of NRC's 19 institutes across Canada. Storey will take up residence at the NRC Institute for Fuel Cell Innovation in Vancouver, British Columbia. Richards, meanwhile, will join the NRC Institute for Information Technology in Ottawa.



One of the winning teams at the Engineering Challenge during National Engineering Week.

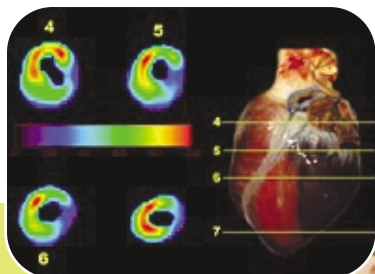


Several NRC research facilities, such as the low-speed wind tunnel at the NRC Institute for Aerospace Research, were open to the public as part of the Doors Open event in Ottawa.

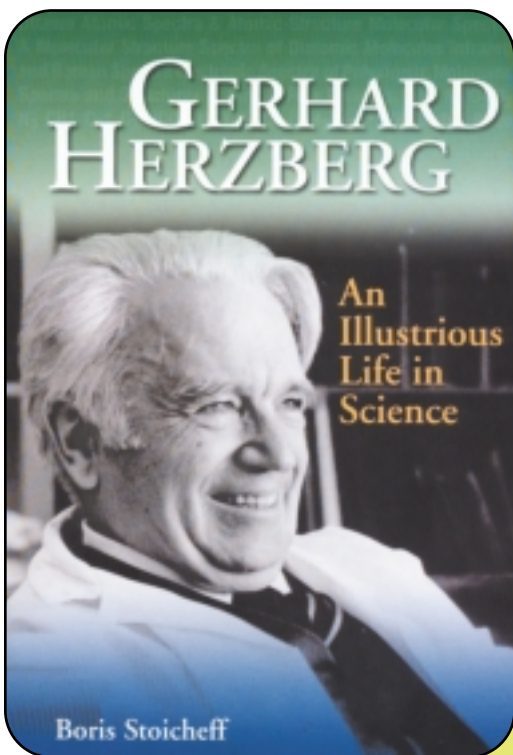
### Science Outreach – Fostering Innovation through a Science Culture

A strong science culture is a keystone of Canada's innovation system. Young Canadians, in particular, need to understand the benefits of learning science and engineering for their future careers and adult lives. In addition to direct experience, employment and training opportunities, NRC works to interest young Canadians in careers in science and technology through a variety of activities in communities across Canada. These include visits programs for schools (and their teachers), science and engineering challenges, science promotion activities, such as the publication of science resource materials, and exhibits, such as The Centre of the Universe, the interpretive centre for the Dominion Astrophysical Observatory in Victoria, B.C.





NRC researchers use  $^{87}\text{Rb}$ -NMR (nuclear magnetic resonance) to increase our knowledge of the role of potassium channels in tissues such as the heart.



### Promoting Science, Technology, Engineering and Math

NRC expanded its national distribution of science promotion materials to young people in 2002–2003, sending over 136,000 bilingual NRC science resources, such as its Canadian Skies and Periodic Table posters, to schools and individuals across Canada. In addition, NRC published an insert in *Teach* magazine and promoted its resources with teachers, provincial education ministries, resource centres and school boards coast to coast. NRC made materials available both on the NRC Web site as well as SchoolNet and

the Ontario Ministry of Education, Science and Technology portal site for teachers and students.

The NRC Press launched a new biography series with the publication of *Gerhard Herzberg: An Illustrious Life*

*in Science*. The series will

include biographies of individual Canadian scientists or engineers and thematic biographies of groups of scientists and engineers. The next scheduled biography features former NRC researcher George Klein, described as a “Northern Edison” for his long track record of ground-breaking inventions in diverse fields including aerospace, telecommunications and biomedical engineering.

NRC's new corporate Web site, launched in December 2002, incorporated a section dedicated to resources, facts and figures of interest to inquiring young scientific minds. Work also began on a complete update of NRC's popular Periodic Table supplement – an online version will be launched by the summer of 2003.

### **Science Challenges and Competitions**

*National Engineering Week* – NRC continued its highly successful Engineering Challenge for elementary students during National Engineering Week. The Engineering Challenge puts engineers in the classroom with elementary teachers to engage student teams in a problem-solving activity linked

to the science curriculum. The event, which grows more popular each year, involved more than 580 Ottawa-area Grade 5 and 6 students. The theme this year involved the construction of an Arctic Provision Transporter (APT) intended to drop supplies to an Arctic expedition. Each student team built a vehicle designed to carry and protect its cargo (a raw egg) from a 1.75 metre drop down an elevated ramp. APTs had to get close to the target on the floor below and with the egg intact. Creativity and innovation in construction and presentation were also evaluated.



***National Aventis Biotech Challenge Winner, Anila Madiraju***



**Youth Fellowship Recipients**

*Aventis Biotech Challenge* – NRC also maintained its support for the Aventis Biotech Challenge offering high school students the opportunity to explore biotechnology, through science projects in molecular genetics, microbiology, biomaterials, environmental biotechnology and other applications. This year, NRC researchers mentored a number of teams in the Challenge. And NRC hosted the Challenge finals, linking its facilities across Canada via videoconference as participants from 12 different cities made their presentations to the judging panel.

*Canadian National Marsville* – NRC provided support to Canadian National Marsville – the cross-Canada Space Science and Astronomy Program that offers grades 6–8 students the

chance to explore the Mars environment and create life-support systems suited to the red planet.

*Canada-Wide Science Fair* – Each year, close to 400 students in grades 7 to 12 gather for the Canada-Wide Science Fair, a prestigious event where innovative projects from numerous fields compete for top honours. For the 2002 event, the NRC Plant Biotechnology Institute took a leadership role in judging a number of projects entered in the competition.

*Youth Fellowships* – The NRC Institute for Marine Biosciences (NRC-IMB) awarded Youth Fellowship awards to three students from J.L. Ilsley High School in Spryfield, Nova Scotia. With help from NRC-IMB

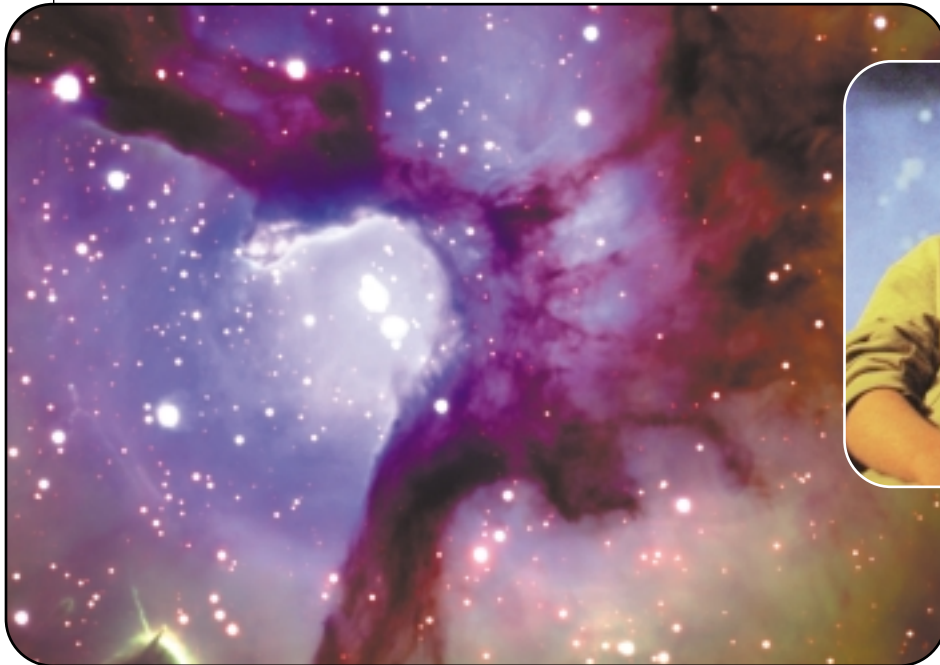
researchers who mentored the team, the students demonstrated the effectiveness of discarded scallop shells to improve the water quality of the MacIntosh Run – a river flowing through their school property. The team has tested the system in Halifax Harbour and, with continued help from NRC-IMB, has taken steps to publish their work in a scientific journal.

### **Starring Role in Student Contest**

When researchers created a contest designed to give Canadian elementary school students a chance to use some of Canada's observing time at the Gemini Observatory in Hawaii,

they had no idea that valuable scientific data would result. One of the winning essays in the contest by 13-year-old Vancouver student, Ingrid Braul, proposed taking a picture of the Trifid Nebula. The resulting picture and associated data produced a spectacular image of a Herbig-Haro jet within the nebula; these jets are high-velocity explosions associated with very young stars and provide information about how stars form and evolve. Scientists expect to study the image further. The contest was started to help bring more awareness of astronomy to the classrooms.

**Trifid Nebula**



*Photos courtesy of Gemini Telescope*