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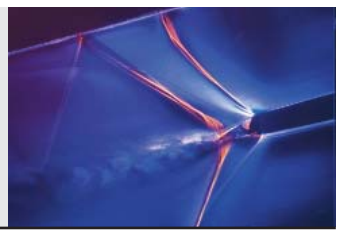

NRC NEWSLINK

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Detecting deadly threats

World class people are working together across the federal government and academia — it's a great team." Ted Sykes, CRTI nuclear-radiological portfolio

Emergency first responders such as the RCMP, military and local police could be better equipped to combat terrorism thanks to a new portable device for detecting anthrax. The device, called a biosensor, is being developed under the federal government's Chemical, Biological, Radiological, Nuclear and Explosives Research and Technology Initiative (CRTI).

The biosensor can quickly confirm or rule out the presence of anthrax on site by comparing a swab with a sequence of anthrax DNA. "It's very specific and eliminates any inaccuracies caused by contamination from other substances," says Caroline Vachon of the NRC Industrial Materials Institute (NRC-IMI) in Boucherville, Quebec. The technology could also be customized to detect other organisms such as *E. coli* or *Salmonella*. "Down the road, it could be adapted for use in agriculture, biofood and the environment," she says.

NRC is the lead federal organization in the project, which includes two NRC institutes (NRC-IMI and the NRC Steacie Institute for Molecular Sciences), Defence Research and Development Canada (DRDC) Suffield, the Université Laval, the Centre Hospitalier Universitaire de Québec (CHUQ) and the RCMP.

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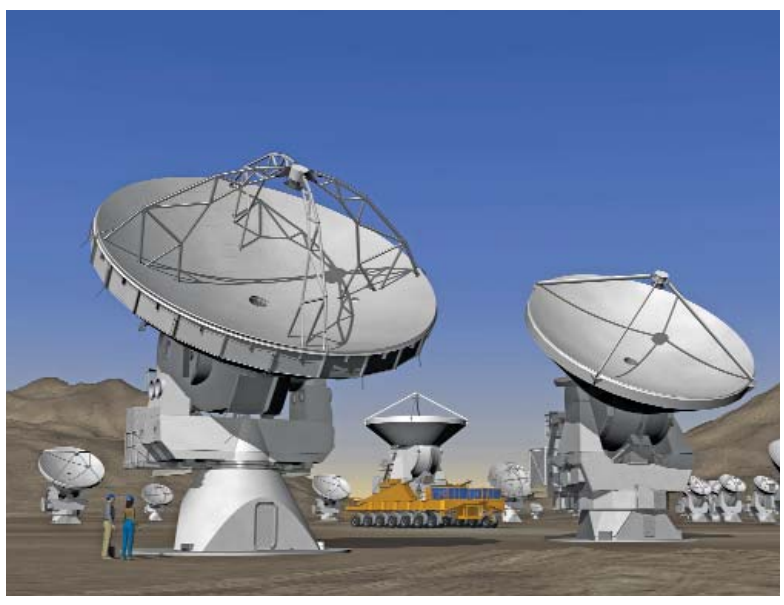
Image courtesy of I. Summerell, RCMP

Astrophysics goes to market



NRC leads Canada's participation in the Atacama Large Millimeter Array (ALMA) — an international collaboration between North America, Europe and Japan to build the world's most sensitive telescope array.

Image courtesy of ESO/ALMA

A radio receiver designed to capture the faintest whispers from the cosmos is finding earthly application in the hands of a Canadian company. Nanowave Technologies of Etobicoke, Ontario has licensed a component of the Band 3 receivers developed by NRC for the Atacama Large Millimeter Array (ALMA) — a system of 66 radio dishes being built in the high altitude desert of northern Chile.

The component of interest to Nanowave is a cryogenic amplifier that boosts the weak radio signals from distant stars and galaxies without adding unwanted noise. "Apart from radio astronomy, this amplifier could have great value for telecommunication systems, solid state physics research, materials research and low temperature physics research," says Keith Yeung of the NRC Herzberg Institute of Astrophysics in Victoria.

"The technology licensed from NRC could open up new markets for commercial and defence radar and satellite communications."

Dr. Justin Miller, President, Nanowave Technologies

Nanowave will manufacture the 300 amplifiers needed for ALMA, and will also market the technology globally to universities, research labs and semiconductor companies. "We believe that the technology licensed from NRC could open up new markets for commercial and defence radar and satellite communications," says Dr. Justin Miller, President of Nanowave Technologies. The French Atomic Energy Commission has already purchased two amplifiers for its advanced nanomaterials research, as has the California-based Combined Array for Research in Millimeter-wave Astronomy (CARMA).

NRC's amplifier is a critical component of the Band 3 receiver that Canada is contributing to the international ALMA project — a partnership between North America, Europe and East Asia. With its sensitive receivers, high resolution and location at 5,000 metres above sea level, ALMA will be at least 10 times more powerful than similar telescopes. Astronomers believe that ALMA will reveal new truths about the birth of stars and planets, the formation of galaxies, and the history of the universe.

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Canada

President's outlook

Dr. Pierre Coulombe
National Research Council Canada

The power of partnerships

NRC's success in helping to bring S&T innovations to market is largely the result of the partnerships we've built. By collaborating with our industrial partners and clients, universities, government, research funding agencies and economic development organizations, NRC turns individual strengths into powerful collective efforts.

NRC partnerships arise from different needs and opportunities. Partnerships can begin with collaborative research agreements, research and service contracts, or technology transfer agreements. Or they can involve contributions of funding, laboratory space and equipment, and property for new buildings.

NRC seeks partners with the expertise, assets and readiness to advance research on top national concerns. For example, to increase the pace of fuel cell discovery in Canada, we partnered with the University of British Columbia, Simon Fraser University, the University of Victoria, Canada research chairs and firms working on fuel cell technologies. Hydrogen and Fuel Cells Canada, Natural Resources Canada and the Vancouver Fuel Cell Vehicle Program are also working with us. This multi-partner collaboration, centred on our hydrogen and fuel cell-focused research facility in Vancouver, will help make this community a global provider of alternative energy solutions.

On the health front, we have joined with partners in Prince Edward Island to create the Centre for Bio-Resources and Health. NRC, the University of Prince Edward Island, Agriculture and Agri-food Canada, and the Atlantic Canada Opportunities Agency are covering the cost of staff, equipment, construction and research projects. Companies that incubate in our Charlottetown facility benefit from the research, education, scientists, equipment and infrastructure made possible through partnership.

NRC seeks partners with the expertise, assets and readiness to advance research on top national concerns.

In Ottawa, we operate a $43 million photonics fabrication facility, the result of a visionary partnership between NRC, Carleton University and the Province of Ontario. This facility supports the growth of the Canadian photonics sector by helping companies, universities and other organizations develop prototypes for advanced photonic devices. It also provides a learning environment for Carleton doctoral students to increase their photonics skills.

Our latest partnership-driven initiative is the new Bioproducts National R&D Program, led jointly by NRC and Agriculture and Agri-food Canada. Both organizations are contributing assets, expertise and networks to plan a research program of the greatest benefit to Canadians.

These are just a few examples of the powerful NRC partnerships that are increasing the pace of discovery and commercialization in Canada. True to the spirit of the federal government's strategy, *Mobilizing Science and Technology to Canada's Advantage*, NRC's collaboration with partners delivers better outcomes for Canadians. ■

Astrophysics goes to market

Continued from page 1

Although Band 3 is one of 10 frequency bands required for ALMA, it is a critical one for operation of the telescope. "All of the receiver bands will require data from Band 3 to calibrate their observations," says Dr. Lewis Knee, who has taken leave from his duties as the Canadian project manager for ALMA in order to work in the telescope construction team in Chile. "The fact that NRC is building the Band 3 receivers represents a real vote of confidence from our partners at the National Science Foundation in the U.S."

NRC's participation will guarantee that Canadian astronomers can use ALMA to study the birth of planets, stars, galaxies — even the formation of organic molecules in space. "Ultimately, ALMA will help us to understand how planets formed around our Sun, and how common planets are in the universe," says Dr. Knee. "That knowledge has many implications for the study of life beyond our solar system."

NRC also manages Canada's involvement in international observatories in Hawaii and Chile, including the James Clerk Maxwell Telescope, the Canada-France-Hawaii Telescope, and the Gemini North and South telescopes. Through its participation, NRC ensures that the more than 450 astronomers in universities and research organizations across Canada can take full advantage of these facilities. ■

Image courtesy of ESO/ALMA

Detecting deadly threats

Continued from page 1

Over three years, these partners will develop a robust prototype that RCMP officers can test in a field simulation. Ian Summerell of the RCMP says that existing devices don't always take into account the protective gear that first responders must wear when entering a contaminated site. "Some of these devices have small buttons that you can't push when wearing heavy gloves, or screens that you can't read under poor lighting conditions," he says.

The biosensor is one of two NRC-led projects that received the go-ahead from CRTI last summer. The other is a wearable dosimeter that uses real DNA to measure an individual's exposure to radiation. "A DNA-based dosimeter will not only tell us how much radiation a person has absorbed, it will also give us a better feel for how much damage was caused to the person's DNA," says Vachon.

The dosimeter could be used by first responders on the site of a radiological dispersal device or "dirty bomb". It could also be adapted for workers in the nuclear industry or in hospitals where X-ray machines are used.

In addition to NRC, DRDC Ottawa, the Université Laval and CHUQ, the project includes partners from the Royal Military College of Canada in Kingston and the Director General Nuclear Safety. The combination of partners was a key factor for CRTI in its decision to support the project. "You've got world class people working together across the federal government and academia," says Ted Sykes, who manages the nuclear-radiological portfolio at CRTI in Ottawa. "It's a great team."

NRC has participated in CRTI projects since 2002, when the program was launched by the federal government to improve Canada's security and counter-terrorism efforts. ■

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GUEST EDITORIAL

Paving the way to American markets

by Don Gerhardt, LifeScience Alley, Minnesota

In September, at *NRC Connections 2007: The Technology Cluster Advantage in Canada*, Don Gerhardt presented lessons learned by the medical technology cluster he supports in Minnesota. Gerhardt is a board member of the BioMedical Commercialization Centre housed at NRC's biodiagnostics research facility in Winnipeg. As President of LifeScience Alley, he is helping to pave the way between Canadian S&T and success in the American marketplace.

Canada's scientists produce many sophisticated and innovative biotechnologies, but Canadian firms that hope to commercialize these technologies face major challenges. An imposing hurdle for would-be global bioscience companies is to successfully enter the U.S. market.

To succeed in the U.S., Canadian firms would be well advised to establish a physical presence — an office, demo labs, a sales and marketing team — in the States. American investors and buyers are more willing to look at what's being offered if they don't have to leave the country to see an innovation and meet the people behind it. This cuts away the barrier — real or imagined — of the Canada-U.S. border.

I recommend that young Canadian firms avoid setting up initially in one of our big, expensive American coastal cities, where they often go broke before getting the big break. Instead, they would benefit from a "soft landing" platform — a place where, at lower cost, they can easily access the services and infrastructure that are crucial to their success.

Two Minnesota-based organizations — the BioBusiness Alliance of Minnesota and LifeScience Alley — are leading the development of a new International Business Support Center. It will function much like NRC's industry partnership facilities, but with an even stronger focus on market entry. Minnesota is consistently rated as the best area in the world for bioscience companies to find the expertise they need in S&T, intellectual property law, financing, marketing, engineering, information technology and regulations to succeed in the U.S. market.

By offering this service, Minnesota is not trying to influence Canadian companies to move to the U.S. Our aim is to help Canadian firms flourish by growing their U.S. market through their presence here in Minnesota. We would want the same advantages for U.S. bioscience companies hoping to enter the Canadian market.

To facilitate commercialization for Canadian firms, here in Minnesota we're already planning cross-border business support, education and training. The pieces are there. All we need to do is move toward each other, working as partners pursuing a shared opportunity. ■

For more information, Canadian companies should contact:

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SUPPORTING INNOVATIVE COMPANIES

New breeding ground for nanotech innovation

Canadian companies that seek to exploit the potential of nanotechnology have found a new home in Edmonton among Canada's largest group of nano-scale researchers. The NINT Innovation Centre, on the campus of the University of Alberta, officially opened its doors in September. The Centre already boasts six tenants and could house up to 15.

The NINT Innovation Centre rents lab and office space to companies that can benefit from close proximity to the more than 200 researchers and technical staff at the NRC National Institute of Nanotechnology (NINT) and the University of Alberta. The Centre occupies the fourth floor of the building that houses NINT as well as workers from industry and universities.

Keith Gilchrist, an NRC business development officer, manages the NINT Innovation Centre. "It serves more than just start-ups and SMEs," he says. "It also welcomes small research teams from multinationals and collaborators. By hosting small and large established companies in the same building as NRC and university researchers, we create a unique environment for innovation."

The NINT Innovation Centre brings companies into close contact with our nation's top researchers in nanotechnology, providing a unique environment for nano innovation in Canada.

Among the new tenants, IOSIL Energy aims to become a leading producer in the emerging photovoltaic-silicon market by exploiting a lower-cost, granular silicon production technology.

Picomole Instruments is developing ultra-sensitive gas analysis technologies for medical, veterinary, occupational health and safety, and environmental applications.

CBF Systems provides product development services to hardware development companies, including prototype design and production, redesign for commercial requirements and regulatory objectives, interface design, product/system packaging and safety certification.

Acoustic Vision Technologies is developing new ultrasonic transducers and systems for non-destructive testing and will offer companies non-destructive testing advisory services to support technology development.

Emicellex Energy aims to build bio-refineries that will maximize the production of ethanol and high-value products from agricultural waste, using a proprietary process.

The largest tenant is a research group formed through collaboration between NINT and Xerox Research Centre Canada. Supported by NRC, the Government of Alberta and Xerox Canada, the research group will focus on R&D for materials-based nanotechnology over the next three years.

The NINT Innovation Centre is funded by Western Economic Diversification Canada, the Government of Alberta and NRC. Besides providing office and lab space, the Centre supports commercialization by linking technology entrepreneurs to services in business planning, financing and strategy.

NINT operates as a partnership between NRC and the University of Alberta. ■

What's this?

This photograph, called a "Schlieren image", shows the air flow structures inside the turbine section of a gas turbine engine. Schlieren lighting is a colour filtration technique for illuminating density variations in transparent fluids, such as air.

This photo was taken as part of an NRC R&D program designed to increase gas turbine engine performance by improving the internal aerodynamics of the turbine section. ■

Correction – The fall 2007 "What's This?" image of a marine phytoplankton was photographed using ultraviolet light (fluorescence microscopy) rather than electron scanning microscopy.

TECHNOLOGY CLUSTER INITIATIVES

Cluster connections — new lessons

There's been a lot of buzz recently about technology clusters and what makes them tick.

Last September, NRC brought together some 200 experts, decision makers and practitioners from industry, government and academia in Toronto to explore S&T-based approaches for accelerating and sustaining Canada's economic growth. *NRC Connections 2007: The Technology Cluster Advantage in Canada* provided the first national forum for exchanging experiences and best practices among Canadian cluster stakeholders. The conference helped fine-tune the lessons learned during the first seven years of NRC's cluster development strategy.

W. Daniel Mothersgill (National Angel Organization) emphasizes a point to his breakout group at Connections 2007.

Representatives from start-ups, small and medium-sized enterprises (SMEs), risk capital firms, cluster organizations, municipalities, universities and government research organizations shared their mistakes, successes and observations. International panelists brought insights from activities underway in Denmark, Sweden and the United States. Participants worked together to identify ways that clusters of technology-intensive firms focused on specific sectors of S&T can fuel Canada's competitiveness and prosperity.

"Companies are more powerful working together than they are on their own," said Dr. Jayson Myers, keynote speaker and President of the Canadian Manufacturers & Exporters Association. "This is true whether they are connecting through personal interactions, technology, business opportunities, supply chains or clusters."

Discussions at *NRC Connections 2007* focused on a variety of topics. Among them: building partnerships, facilitating collaboration, cluster marketing and branding, developing international markets, attracting investment, technology roadmapping, intellectual property issues and solutions, measuring the impact of cluster initiatives, and more.

Participants learned that there is no single model for cluster development, and that continuity of leadership is essential over the years required to develop a cluster. They also learned that branding a cluster on the world stage helps it attract capital, companies and talented people. It also increases the market visibility of cluster firms that are trying to enter international markets.

Rory Francis facilitates a breakout session at Connections 2007.

"NRC has invested a great deal in technology clusters as a mechanism to accelerate innovation and commercialization. This conference provided an excellent progress report and a great environment for sharing what's been learned. Thank you!"

Rory Francis, Executive Director, Prince Edward Island BioAlliance

These were just a few of the key lessons. SMEs also received many tips on how to survive the early years and thrive.

To tap into the details, read the conference report posted at **connections-connexions2007.nrc-cnrc.gc.ca/** And stay tuned for updates on *NRC Connections 2008*, to be held in Ottawa next autumn. ■

WORKING WITH INDUSTRY

How white is white?

"Standards keep people honest. They create a level playing field in business, and we like that."

Denis Doutre, Director of Technical Field Services, Domtar Inc.

White means big money in the pulp and paper industry. For decades, manufacturers of fine paper have used fluorescent additives to whiten their paper, which increases the price they can charge for their product. "It commands premium value in the marketplace to have a paper product that is seen as being very white," says Robert Wood, Executive Director of the Pulp and Paper Technical Association of Canada.

But how do Canada and its trading partners agree on whiteness? For the past decade, NRC has been the world's keeper of optical property standards for fluorescently whitened paper as set by the International Organization for Standardization (ISO). Paper companies around the world trace their whiteness measurements back to ISO-authorized labs such as the Pulp and Paper Research Institute of Canada (Paprican), and these labs in turn trace their standards back to the measurement science labs at NRC.

"That traceability is important to our big customers — the companies that buy thousands of tonnes of paper a year from us," says Denis Doutre, Director of Technical Field Services for Domtar Inc. "They know the whiteness value we give them is a true number — we didn't just make it up."

Tracing their measurements back to NRC also saves companies money. With world markets creating a demand for whiter paper, Canadian companies must prove that their whiteness values are up to ISO standards, or they risk having to add more fluorescent material to their product. "That can add up to several dollars per tonne of paper, and in our business that can make or break you," says Doutre.

The "whiteness" of paper is a key component of its market value. NRC, which is recognized as the world authority in paper whiteness measurements, developed the reference instrument that establishes the absolute whiteness level for various types of paper.

NRC works with Paprican and the other four ISO-authorized laboratories in the U.S., Sweden, Finland and France to make sure that companies around the world have access to the highest quality standards for paper whiteness. NRC and Paprican are also working with the International Commission on Illumination (CIE) to improve the lab methods used to measure paper.

"For fluorescent paper, it's critical that the type of light you're using for instrumental measurements of whiteness accurately simulates the average office lighting conditions under which the paper will actually be used," says Dr. Joanne Zwinkels, leader of the photometry and radiometry group at the NRC Institute for National Measurement Standards in Ottawa. "We're working with the CIE to recommend a standardized 'indoor daylight' which is closer to real-world lighting conditions."

NRC works with other national metrology institutes around the world to maintain the global standards that are critical for international trade — everything from time, length and mass to novel measurements needed for medicine, nanotechnology and biotechnology. ■

LEADING-EDGE R&D

NRC Aerospace goes green

NRC Aerospace has launched an ambitious new research direction to help the Canadian aerospace sector compete internationally on the basis of environmental responsibility. The "Green Initiative" — the linchpin in NRC's strategic plan for this sector — was unveiled in December in Montréal.

Under this initiative, NRC Aerospace in partnership with other NRC facilities will work on nanotube composite materials, eco-friendly advanced coatings, alternative fuels, noise and emissions reduction technologies, green manufacturing processes and other environmentally sustainable products and processes. "In our Aerospace Manufacturing Technology Centre in Montréal, for example, we're looking for machining processes that use up to 90 percent less machining fluid as a way of reducing the industry's environmental footprint," says NRC Aerospace Director General Jerzy Komorowski.

Why go green? "For decades, safety, weight and cost have been the primary concerns in the aerospace industry," he explains. "Now there's a fourth driver — the environment — as the industry scrambles to meet imminent, more stringent environmental regulations. At the Paris Air show in June 2007, the talk was all 'green' for the first time in aviation history."

According to Komorowski, NRC laboratories are uniquely positioned to "rally around" environmental issues, while continuing to help the aerospace industry compete over safety, weight and cost concerns. "Biofuels research is a good example of how almost every NRC institute can work toward a high level goal that addresses big issues for society at large," he says.

"For example, marine and land-based plants are both considered potential sources of biomass from which new aerospace fuels could be manufactured," says Komorowski. "Our biology institutes can give a competitive advantage to the people who will grow or harvest the plants, while our biotechnology institute can help the people who will transform these plants into fuel. Our materials researchers can then develop new coatings or materials and our engineers can come up with new gas turbine engine designs."

"So at every level of the supply chain, NRC can help different sectors of Canadian industry become more competitive," concludes Komorowski. "Our ultimate goal, of course, is to help the aerospace industry, which is so important to Canada." ■

With the new Green Initiative, NRC researchers will tackle environmental issues such as aircraft noise and emissions.

Did you know? Canada's aerospace industry is the world's fourth largest — surpassed only by the United States, United Kingdom and France. The sector produces almost $22 billion in annual revenue, accounting for about two percent of Canada's GDP. It employs some 75,000 highly skilled professionals in more than 400 companies.

Federal partnership — taking IP to market

Over the past decade, FPTT members have filed more than 2,000 patent applications and earned over $125 million in royalties from licensing intellectual property (IP) developed in federal laboratories.

Federal Partners in Technology Transfer (FPTT) officially "comes of age" this year, celebrating its 18th anniversary as an umbrella group for technology transfer specialists.

FPTT brings together business development officers across the country to establish common approaches, practices and policies in order to effectively transfer research and technologies from government labs for the benefit of Canada. The network represents over 15 science-based organizations, including NRC, Industry Canada, Health Canada, Environment Canada and Natural Resources Canada.

"FPTT is unique in government. We are the oldest and most successful interdepartmental partnership of its type," says FPTT director Morna Paterson. "The strength of FPTT is measured by the relationships it builds, the knowledge it helps develop and share, and the technology transfer it enables."

Launched in 1990 as an interdepartmental working group on intellectual property, the organization was renamed FPTT in 1996 and a secretariat was established at NRC's Montreal Road Campus in Ottawa. "Before 1990, all of the IP developed in federal labs was handed over to Canadian Patent and Development Ltd., which looked after patenting and commercializing discoveries," says Paterson. "Unfortunately, this process didn't work well because there was little communication between inventors and licensees, a key to the successful transfer of technology."

Today, FPTT facilitates communication among members through an annual national meeting and regular chapter meetings, training workshops, webcasts and audio conferences. Its website offers access to information on:

- technologies, business opportunities, expertise, facilities, programs and services of federal labs;
- technology transfer and IP management information, tools and Internet resources;
- legislation and policies related to intellectual property;
- federal and provincial assistance programs;
- other organizations involved in technology transfer worldwide; and
- upcoming events, conferences and seminars.

Each year, FPTT holds the Excellence in Technology Transfer competition to recognize best practices that have been used to develop techniques, services and products that create jobs in Canada and new markets beyond our borders. The nomination deadline for the next competition is March 3, 2008. ■

For more information about FPTT, visit: www.fptt-pftt.gc.ca/eng/index.html

UPCOMING EVENTS

Fire Safety Research for Better Building Design, multiple 2008 dates at locations across Canada

This seminar provides practical fire safety information for construction professionals engaged in the design and construction of new and existing buildings, the management and operation of facilities, and the application of building and fire codes. Code compliance issues will not be addressed. In the past decade, significant advances in fire engineering and the understanding of human behaviour have and continue to contribute to better and safer buildings. For details and dates for each city, consult: **irc.nrc-cnrc.gc.ca/pubs/bsi/2007/reg_e.html**

Emerging and New Approaches to R&D Management, June 18–20, 2008 in Ottawa, Ontario

This conference will look at practices, models, theories, frameworks and case studies to provide insight and better equip R&D-based organizations to deal with today's environment — allowing for better decisions with greater impact. Potential topics include: R&D for emerging technologies; managing R&D in China, India and other emerging economies; setting R&D direction and investments in the face of uncertainty; partnerships and collaborative approaches; and models to maximize the impact and value of R&D. For details, contact Flavia Leung by email: **Flavia.Leung@nrc-cnrc.gc.ca**

Laser-induced Incandescence: Quantitative Interpretation, Modeling, Application, July 30–August 1, 2008, in Ottawa, Ontario

Laser-induced incandescence (LII) is a powerful tool for particle concentration and particle size measurements in combustion and particle synthesis, as well as in environmental applications. The objective of this meeting is to identify and address the hurdles facing LII for its acceptance as an industry standard for particulate measurement. The unique capabilities of LII over other diagnostics will be identified and strategies developed to overcome inertia from industry. For more information, consult: **www.liiscience.org**

LEADING-EDGE R&D

Fifty years and still vital

On November 3rd 2007, the National Research Universal (NRU) reactor — the pride of Chalk River Laboratories — turned 50. Its golden anniversary coincided with a new five-year, $6.5 million grant allowing Canadian academics to conduct research using the neutrons generated by NRU.

Built in 1957 by Atomic Energy of Canada Ltd., the NRU is a top training ground for nuclear science, engineering and technology. There, scientists designed and tested many of the fuels and materials for the CANDU reactor — the world's most efficient nuclear power system. The NRU reactor also generates medical isotopes that are used to diagnose and treat cancer and other serious illnesses in more than 20 million patients around the world each year.

At Chalk River, the NRC Canadian Neutron Beam Centre, based at NRU, harnesses neutrons produced by the reactor to operate a suite of neutron spectrometers — devices for investigating the properties of materials down to the atomic scale. Since 2003, the NRC facility has attracted scientists from Canadian universities in every province and more than 100 different institutions in 14 countries for independent and joint NRC experiments.

The five neutron spectrometers run 24/7 with over 80 percent of the spectrometer time involving external users — from universities, industries and government laboratories across Canada and abroad.

Alastair McIvor (left) and Dr. John Root of the NRC Canadian Neutron Beam Centre. Since 2003, scientists at more than 100 different institutions around the world have used the NRC facility.

In May 2007, the Natural Sciences and Engineering Research Council (NSERC) awarded a Major Resources Support (MRS) grant to McGill University physics professor Dominic Ryan and nine other researchers across the country. This grant will allow Canadian professors and students in physics, chemistry, bioscience, materials science and engineering departments across Canada to access the Neutron Beam Centre until 2012.

"Our five neutron spectrometers run 24 hours a day, seven days a week," says Dr. John Root, director of the NRC facility. "Over 80 percent of the spectrometer time is occupied by projects involving external users — from universities, industries and government laboratories across Canada and abroad."

Rather than fund the external user program by collecting user fees from visiting professors, the MRS grant provides longer-term baseline support. It streamlines user access and provides a mechanism for transparent accountability by NRC to Canadian academic users — and they, in turn, to NSERC through normal annual reporting.

"Our user program is a good example of how a federal science facility can maximize its benefits to Canada by engaging the entire knowledge community including universities, industries and government laboratories," says Dr. Root. "The facility also provides access by industry, on a full cost-recovery basis, to increase competitiveness in sectors such as energy, materials production, aerospace, automotive and general manufacturing." ■

PARTNERSHIPS AND COLLABORATIONS

New lab links life sciences players

NRC research officer Dr. Steven Beyea inspects equipment in the new Biomedical MRI Research Lab.

Nova Scotia's life sciences sector will soon get a big boost when a magnetic resonance imaging (MRI) research facility, located at the Izaak Walton Killam (IWK) Health Centre in Halifax, opens this year. The Biomedical MRI Research Lab (BMRL) is the second MRI facility to be established in Halifax by NRC, following the Neuroimaging Research Lab that opened at the Queen Elizabeth II Health Sciences Centre in 2003.

Created through a partnership between the IWK Health Centre and two local NRC institutes — with additional funding from the Province of Nova Scotia and the Canada Foundation for Innovation — the new $5 million facility will help advance the evaluation, diagnosis and treatment of diseases and disorders as well as the development of new therapeutic drugs.

"BMRL, with NRC's presence, positions Halifax among the leading magnetic resonance imaging centres in Canada — and will help support the creation of life sciences or biotech companies, increasing investment in the region."

Denise Lalanne, NRC

The Biomedical MRI Research Lab will focus primarily on studies involving cellular/molecular imaging and drug development and delivery. By harnessing new imaging techniques developed by the Atlantic laboratory of the NRC Institute for Biodiagnostics (NRC-IBD), local researchers will be able to study the movement of drugs *in vivo* (inside the body), as well as immunological responses and molecular changes that occur at the cellular level.

The state-of-the art lab is strategically located to take advantage of an existing community of neuroscientists, chemists, immunologists, virologists and clinician researchers in the Halifax area. Users will include not only scientists from NRC-IBD (Atlantic), the NRC Institute for Marine Biosciences (NRC-IMB), and the IWK Health Centre, but also Dalhousie University and the Capital District Health Authority.

"The BMRL, along with NRC's presence, positions Halifax among the leading magnetic resonance imaging centres in Canada — and will help support the creation of life sciences or biotech companies, increasing investment in the region," says Denise Lalanne, the business development officer for NRC-IBD (Atlantic). "More and more, companies want to use MRI on animal models so they can tell whether the drugs they're giving them actually do what they're supposed to do, and whether they impact anything else in the body that they're not supposed to," she adds.

To address this need, "the BMRL will incorporate techniques for creating MR-visible markers that we can tag to cells or molecules to make them stand out," says Dr. Ryan D'Arcy, who leads the NRC-IBD (Atlantic) facility. "This means you can do things like watch stem cells as they migrate towards their target, follow inflammation cells as they move toward the site of an injury, or label a therapeutic compound to see whether it can cross the blood-brain barrier."

The BMRL initiative was conceived in 2004 when NRC and the IWK Health Centre joined forces to submit a proposal to the Canadian Foundation for Innovation's Research Hospital Fund. Both NRC institutes provided MRI technology and expertise, while the IWK Health Centre allocated space for the new facility. ■

PARTNERSHIPS AND COLLABORATIONS

Aerospace materials centre takes flight

McGill University and NRC have created a multi-lab research centre in the Montréal area to support the development of new materials and manufacturing processes for Canada's aerospace industry.

Launched on December 17, 2007, the $7.8-million McGill Aerospace Materials & Alloy Development Centre boasts three leading-edge technology facilities. They include a cold spray lab housed at NRC in Boucherville; a laboratory for advanced materials coating technology, called electron beam physical vapour deposition, located at McGill University; and an isothermal forging press for manufacturing critical jet engine components made from superalloys and other materials, based at the NRC Institute for Aerospace Research (NRC-IAR) facility located on the Université de Montréal campus.

While all of the equipment is owned by McGill, NRC has signed a five-year partnership agreement to conduct joint R&D activities with the university. "The ultimate goal of this research centre is to increase the competitiveness of our aerospace industry and to strengthen the leadership position of Canada in aerospace research," says Dr. Christian Moreau, who leads the project at the NRC Industrial Materials Institute (NRC-IMI).

At a cost of $3.4 million, the cold spray laboratory represents the largest component of the new research centre. Cold spray is a new manufacturing method for depositing metals and alloys that involves accelerating a solid state powder in a supersonic gas jet. Upon impact, the particles undergo plastic deformation and bond to a surface.

Cold spray technology is used to spray specialized coatings of advanced materials onto aircraft parts to help them perform in extreme temperatures and corrosive environments.

"One objective of this collaboration is to show the viability of this technology for industry," says Dr. Moreau. "We've set up one of the best cold spray labs worldwide. Now that we have the equipment, we expect to attract a lot of interest from aerospace companies."

Building on their respective strengths, the two NRC institutes have worked in close collaboration with McGill University since 2003 to make the new centre a reality. Funding for the research centre came from the Canadian Foundation for Innovation (40%), the Government of Quebec (40%), and NRC and industrial collaborators (20%).

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This collaboration is also in line with NRC's new business strategy to contribute to the global competitiveness of Canada's nine leading industrial sectors, which include aerospace and manufacturing. ■

SCIENCE OUTREACH

Student explorers for "Red Planet"

Can humans survive on Mars? This year, more and more science classes across the country will get a chance to find out how they would fare as the first inhabitants of the "Red Planet", thanks to plans to expand Canadian National Marsville, an NRC-led science outreach program for youth.

NRC assumed leadership of the national Marsville program in June 2006 — creating a student-friendly Web site, including interactive team blogs. "Our outreach efforts are designed to encourage students to pursue learning in the sciences. Canadian National Marsville engages students and teachers alike," says Margaret Kennedy, senior science outreach advisor at NRC.

In 2007, more than 2400 intermediate level students from across Canada lived the Marsville experience, and NRC hopes to increase this number in 2008. "We currently have active Marsville programs in Victoria, Vancouver, Whitehorse, Winnipeg, Toronto and Ottawa," says Kennedy. "This year, we would like to involve teachers and students from other regions."

In order to expand the program, NRC invited key players from the formal education and science awareness communities to a national consultation in November. The attendees included the Council of Ministers of Education Canada, the Canadian Space Agency, the Canadian Association of Science Centres, as well as teachers and science promotion organizations. The participants worked together with the aim of developing models for a sustainable Marsville program to meet the needs of educators, help Marsville flourish in their respective communities, and excite students about science and technology.

"Through Marsville, students get a taste for interdisciplinary science," says Kennedy. Working in teams, they research Mars, study what is needed to sustain human life on Earth, and then apply their knowledge to adapt to the Martian environment. "In the process, students learn that there is no 'right' answer — rather, there are many ways of approaching a problem and finding solutions," she stresses.

This year's program begins on January 28 — anniversary of the Space Shuttle Challenger disaster. It will culminate with a national "Link-up Day" on April 18, 2008. ■

Marsville students get a taste for interdisciplinary science. Working in teams, they research Mars, study what is needed to sustain human life, and apply their knowledge.

For more information about Canadian National Marsville, visit: www.nrc-cnrc.gc.ca/marsville

A Marsville team displays its research project, which is designed to help support life in the "Martian village".

Students work together to build a "habitat" — their home on Mars.

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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. NRC operates world-class research facilities as well as information, technology and innovation support networks coast to coast. Its outstanding people help turn ideas and knowledge into new products, processes and services, creating value for Canada. NRC works hand-in-hand with partners from industry, government and universities to help ignite the spark of innovation in communities across the land and to give Canadian companies a competitive edge in today's marketplace.

GLOBAL REACH

Canada and Taiwan strengthen innovation links

From left to right: Dr. Johnsee Lee, President of the Taiwan Industrial Technology Research Institute; Dr. Che-ho Wei, Former NSC Minister; Dr. Chien-jen Chen, Minister of NSC; Dr. Pierre Coulombe, NRC President; Dr. Maw-kuen Wu, Former NSC Minister; and Dr. David Tawei Lee, representing the Taipei Economic and Cultural Office in Canada.

In mid-November, NRC joined the Taiwan National Science Council (NSC) in Taipei to celebrate 10 years of S&T partnership. At the 2007 Canada-Taiwan Innovation Week — an opportunity to showcase and advance S&T, trade, investment and education goals — NRC and NSC renewed their Memorandum of Understanding (MOU) to continue their cooperation.

Since 1997, this S&T partnership has led to hundreds of groundbreaking scientific papers; valuable new technologies and innovations; the sharing of critical knowledge through conferences, workshops and exchanges; and the training of highly qualified research personnel.

"Today, Canada and Taiwan enjoy a vibrant relationship with trade, investment and scientific cooperation at its heart," said Ron MacIntosh, Executive Director of the Canadian Trade Office in Taipei. "Renewal of this MOU lays the groundwork for greater growth and even closer economic, commercial and innovation ties."

Three workshops were also held. The functional foods and nutraceuticals workshop covered product regulations, Canada's Advanced Foods and Materials Network, scientific findings, and the industry and market in both economies. At the biophotonics workshop, participants explored the potential for photonics-based advances in medical diagnostics, treatment and surgery. The hydrogen and fuel cells workshop brought together fuel cell developers, scientists, academics, policy makers and industrial representatives.

The 2007 Canada-Taiwan Innovation Week was organized by NRC with the support of Foreign Affairs and International Trade Canada, National Ressources Canada, Agriculture and Agri-Food Canada, the Canadian Trade Office in Taipei, and NRC's Taiwanese partners. ■