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NSERC Funds New Automotive R&D Projects

At the end of August, NSERC confirmed funding for [five university-industry partnerships](#) that will see researchers working with the private sector to develop solutions to next-generation automotive challenges. The projects focus on an [advanced battery pack thermal management system for hybrid electric vehicles](#), more efficient systems for wheel production, performance enhancing catalytic converters, enhanced fuel cell technology and improved automotive manufacturing workplace design and ergonomics.

The projects are funded under the [Automotive Partnership Canada](#) initiative that supports research and development in specific areas identified by the automotive industry as priorities. These areas include improving the environmental performance and impact of our vehicles, building "smarter" cars, and next-generation manufacturing.

Call for Applications: New Industrial Research Chairs for Colleges Grants

NSERC is now accepting applications for the new Industrial Research Chairs for Colleges (IRCC) Grants. These Chairs support applied research leaders at colleges who will help deliver innovative solutions to local companies. The initiative will also help enhance faculty and staff participation in applied research, increase opportunities for students to gain industrial problem-solving experience, and increase knowledge and technology transfer between colleges and companies.

Chair candidates can be an existing faculty member, staff member, or an external individual—such as an applied research leader in business, whom the college intends to hire once awarded an IRCC Grant. These grants will range from \$100,000 to \$200,000 annually and will be offered in five-year terms. The deadline for applications is November 30, 2011.

For more information, please review the [IRCC Grants description](#).

Successful Partnerships

Interested in partnering? Wondering about the return on investment? Learn how companies across Canada are working with researchers to advance their products or processes by participating in an NSERC partnership.

Three-Way Partnership to Address Corrosion

In aerospace, traditional corrosion protection uses potentially toxic and carcinogenic materials like cadmium. To find a replacement for the cadmium-based coatings used to protect high-strength steels, [Integran Technologies](#) of Toronto and [Andrew Vreugdenhil](#) of Trent University collaborated on an [NSERC Engage Grant](#) project in the summer of 2010.

Integran is a nanotechnology company that develops high-performance materials for a variety of industries, including aerospace and defence. This project combined a novel organic/inorganic top coating developed by Dr. Vreugdenhil and his team at Trent University with Integran's nanotechnology-enabled corrosion coating.

"Combining Integran's nanostructured coating with Trent's novel top coat was an approach that had never been tried before," says Jon McCrea, Integran's Research and Development Manager. In addition to combining the coatings, the researchers enlisted the [Canadian Light Source](#) (CLS) synchrotron in Saskatoon to tell them what was happening between the two coatings and between the coatings and the coated surface.

"We needed a much better understanding of how these materials behave, and to do that we called on Canadian Light Source," says Dr. Vreugdenhil.

Jeff Cutler, Director of Industrial Science at CLS, explains their role. "We saw this as an interesting opportunity, because we're developing the Canadian Innovative Materials Research Centre in Saskatoon, where we're trying to bring CLS together with industry and academia. The Engage Grant project was a microcosm of what we want to create."

Dr. Vreugdenhil says the project yielded two significant findings. "First, initial results show we can improve the performance of the system by combining the two materials.



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Second, we've learned a lot about the individual component materials and the combination of the materials using the Canadian Light Source."

McCrea concurs, "The Engage Grant project contributed to a Canadian solution to a worldwide problem. It also exposed industry to cutting-edge research being done at the university and provided students with experience dealing with industrial problems and needs."

Cooling a Hot Car: Breakthrough in Thermal Management

In 2008, Todd Pratt, CEO of [Future Vehicle Technologies](#) (FVT) of Maple Ridge, British Columbia, had a cooling problem with the lithium-ion battery packs used in the company's prototype plug-in hybrid electric vehicle, the [eVaro](#). Two years and an NSERC Engage Grant later, his collaboration with Simon Fraser University's [Majid Bahrami](#) has paid off.

"They solved the heat issue," says Pratt. "That gives us a much more impressive battery pack and has made the batteries last longer."

Pratt met Dr. Bahrami, an assistant professor with the [School of Engineering Science at Simon Fraser University](#), at a clean energy conference in Vancouver.

"When I first met Todd at the conference," Dr. Bahrami says, "he told me they had a problem with their batteries overheating. They were designing a set of small heat sinks for the battery."

Lithium-ion batteries must be kept within a recommended temperature range, around room temperature. At temperatures near the freezing point, the battery cannot supply energy. At temperatures around 50 degrees Celsius, the battery can catch fire or even explode. Temperature control also prolongs battery life and increases its energy conversion efficiency.

When Dr. Bahrami first saw FVT's battery assembly, he believed the problem was not how to cool the battery, but rather how to eliminate the electrical contact resistance at the interface between the battery electrodes and the collector bars, which was generating significant heat. "We needed to test this theory in the lab. We designed a small testbed, took measurements, developed a preliminary model, and demonstrated that if the electrical contact resistance between the battery electrodes and the collector bars is not treated properly, electricity will be converted into heat, which could melt the entire assembly."

As Dr. Bahrami worked with FVT, he realized the scale of the problem, and the opportunity, was much larger than had first appeared.



"I realized there is a huge need, not only at FVT, but throughout the automotive industry. The focus has been so much on bringing a hybrid electric vehicle to market first that companies have overlooked the challenges related to thermal management in emerging hybrid and electric vehicles."

The success of the project led Dr. Bahrami and FVT to continue their work. A project is now underway under the [Automotive Partnership Canada](#) initiative, exploring an integrated thermal management system for hybrid electric vehicles.

For FVT, the project has opened up business opportunities. "We can apply this to other areas of our business," says Pratt. "In addition to technologies for vehicles, we also do direct-drive generators for wind turbines, back-up power for cell phone towers, and portable power for the movie industry."

Long-Term Collaboration Provides Testbed for New Products

Consider it good for business, and good for small rodents. [GERSTEL Inc.](#) is one of two Ontario companies working with [Janusz Pawliszyn](#) at the University of Waterloo to take a sampling method widely used for environmental testing, forensics, food quality and fragrance detection, and adapt it to biological systems.

Solid phase microextraction (SPME) has already made its mark globally as an environmentally friendly, convenient and efficient technology for collecting and extracting samples for chemical analysis. It represents a significant new business opportunity for a technology that has already earned its licensee—Oakville-based [Sigma-Aldrich Canada Ltd.](#) and its Supelco division—millions of dollars in revenue since its commercial launch. Industry and academia are now pushing its next frontier—drug discovery.

GERSTEL Inc. is one of several instrumentation and automation suppliers who have partnered with Sigma-Aldrich-Supelco to sell SPME devices to customers internationally. Both companies have been long-standing sponsors of Dr. Pawliszyn, the NSERC Industrial Research Chair in New Analytical Methods and Technologies of Sample Preparation, who invented the technology in the 1990s.

"One reason our partnership has been so successful is because the Chair can help us to improve on technologies that are already commercially available," says Collins. "From a business perspective, that certainly reduces the risk because when you introduce a brand new product into the market, it can take several years before it's widely accepted."

Dr. Pawliszyn's lab also helps sponsors by testing and validating SPME products, including GERSTEL's newest product—the [SPME MultiFiber Exchange System](#). Launched in March 2011 in Atlanta at Pittcon—the world's largest annual conference for



laboratory science, the new system has two main advantages over previous systems. Firstly, it automates the sampling process, allowing laboratories to handle higher sample throughputs while increasing reproducibility and efficiency. While the manual process takes a technician about 20 minutes to mount every sample-impregnated fibre prior to separation, automation allows each fibre (up to 25) to be processed without the need for operator intervention.

Secondly, the SPME Multi-Fiber Exchange System creates greater opportunities for collecting samples in the field onto a fibre "dip stick." Analysis can be conducted on-site or back in the lab to determine the type and quantity of chemical present.

"Remote sampling really opens up a lot of opportunities," says Collins. "It's so easy to use. You simply stick the fibre into the air or a liquid to extract the chemical."

The fibres could be used to identify compounds in the air that contribute to sick building syndrome—when chemicals trapped indoors are inhaled by occupants, which can make them sick.

"I'm pretty excited about it because what was missing before was a good field sampler device and that's what Supelco, working with [Chromline Srl](#) in Italy, have developed."

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