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Welcome to the Inaugural Edition of *IN Partnership* Targeted at Canadian Business

IN Partnership is NSERC's new bi-monthly e-bulletin about public-private R&D partnerships that connect industry to the wellspring of knowledge and talent in Canada's colleges and universities. The e-bulletin is an integral part of NSERC's biggest and most visionary plan for industry. Our new [Strategy for Partnerships and Innovation](#) is an action plan to help more Canadian businesses prosper by connecting and collaborating with college and university researchers and students.

NSERC is one of Canada's top sources of grants for public-private R&D partnerships, with investments exceeding \$310 million annually. *IN Partnership* will showcase the many ways that businesses prosper from this investment. It will also inform companies about new opportunities to participate in these collaborative R&D arrangements. To stay abreast of these and other industry-relevant developments, we encourage you to subscribe to this free e-bulletin by visiting www.NSERCpartnerships.ca. Please spread the word to friends and colleagues as well.

Four Stories of Remarkable Company Growth, Productivity Gains, Market Opportunities and Cost Savings Via Industry-Academic Partnerships

1. Small Toronto-Based Firm Becomes World Leader in Nanometals

Integran Technologies has leveraged its relationship with the University of Toronto into a market leading position in advanced nanometals.

With its ability to control and manipulate matter on an unthinkable scale, nanotechnology is enabling scientists to fundamentally redefine the way materials behave. By seizing this

incredible capability, Toronto-based Integran Technologies Ltd., in partnership with the University of Toronto, is pioneering and commercializing a whole new class of nanometals and associated materials that are considerably lighter, tougher, stronger and longer lasting than their conventional counterparts.

Built on a bedrock of NSERC-funded people, discoveries and innovations, Integran has emerged as a world leader in advanced metallurgical nanotechnologies. Its nanometals are finding a host of high-performance applications ranging from the golf clubs used to win the prestigious Masters tournament to novel protective coatings for advanced carbon-fibre composite aircraft components.

Founded in 1999, Integran has experienced remarkable growth in recent years. Since 2007, the company's Canadian-based staff has more than doubled to 55, fuelled by a four-fold increase in revenues during 2008 alone.

More than half of Integran's 40-person R&D team received advanced training through NSERC industrial scholarships and fellowships, as well as NSERC-sponsored research partnerships between the company and the University of Toronto. "NSERC has been with us every step of the way and has played a key role in nurturing the fundamental science, skilled talent and real-world innovations that give Integran its edge," explains Integran CEO Dr. Gino Palumbo.

2. Computer Simulation Helps Boost Productivity and Mitigate Risk in the Construction Industry

Canada's construction industry is realizing tens of millions of dollars in productivity gains from the application of computer simulation tools developed by an NSERC Industrial Research Chair at the University of Alberta, supported by 30 companies.

Dr. Simaan AbouRizk is somewhat of a virtual wonder to Canada's construction industry. For more than a decade, the University of Alberta construction engineering professor and his research team have applied expertise in computer simulation to help an ever-expanding cluster of industry partners enhance their operating methods and bottom lines.

"We are bringing the construction industry into a virtual world that can significantly improve its ability to operate in the real world," explains Dr. AbouRizk, who holds the NSERC Industrial Research Chair in Construction Engineering and Management.

This simulated world—using computers to build, study and manipulate virtual models of real systems—allows construction companies to identify and mitigate risks before real-world operations begin.

AbouRizk says the Chair was created partly to address the industry's comparatively poor productivity performance. The Chair's researchers have designed a set of virtual construction tools for a wide array of productivity-boosting tasks, such as process optimization, decision support and risk analysis. And the payoff has been huge. Today, these powerful, predictive tools are helping industry realize productivity gains worth tens of millions of dollars annually.

PCL Industrial Management Inc., Canada's largest construction group, has applied these technologies to create realistic 3D visualizations of how heavy-lift construction projects will unfold, long before a shovel hits the ground. "These visualizations are a powerful selling tool because you can show the customer persuasive representations of what the construction plan will look like," says Rick Hermann, a senior engineer with PCL.



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PCL has hired more than a third of the 60-odd master's and doctoral students who have graduated from the Chair program. "Now that companies have seen what these students can do, we can't train enough of them," says AbouRizk.

One measure of the industry's growing appetite for tools and students is the phenomenal growth of the Chair itself. When it was launched in 1997, the Chair had six industry sponsors, two faculty and six postgraduate students. Today, it is backed by about 30 organizations supporting five faculty and 50 students.

3. A New Class of Nanomaterials Becoming a Transformative Technology for Multiple Industries

A revolutionary nanomaterial, in which Canada maintains world leadership, holds big promise for the forestry sector and a host of other industries, ranging from aerospace and automotive to plastics and pharmaceuticals.

The smallest structural building block of trees is promising the biggest array of business opportunities for Canada's forest products industry.

Crystallites of cellulose—the most abundant organic substance on the planet—are a relatively new class of nanomaterials that are rapidly advancing towards the marketplace with unrivalled breadth. These revolutionary biopolymers, known in the singular as nanocrystalline cellulose (NCC), are winding their way toward at least nine industries, ranging from aerospace and automotive to medical devices and pharmaceuticals.

This novel nanomaterial is at the heart of a new Business-Led Network of Centres of Excellence called Aborano, which is focusing on applications development.

NCC possesses extraordinary potential due to its strength, optical properties, conductivity, reactivity, self-assembling, anti-microbial, self-cleaning and bio-compatibility characteristics—all of which are controllable. It can significantly improve the performance of a wide assortment of products from exterior paints that last five times longer to plastics that are hundreds of times stronger.

NCC has fascinated university researchers since its self-assembling properties in aqueous suspension were first demonstrated in 1961 by a Université de Montréal chemistry professor, Dr. Robert Marchesseault. It would take almost four more decades, however, before NSERC-funded scientists at McGill University fully understood NCC's remarkable attributes.

With the advent of ever more powerful imaging tools, such as transmission electron microscopes and atomic force microscopy, the science gathered considerable momentum. These tools enabled unprecedented insights into NCC's properties and behaviour at the nano scale.

NCC made a quantum leap toward commercialization in 2006. That's when production of pilot-scale quantities (kilograms per week) began at the Montreal-based Paprican division of FPIInnovations, the world's largest forest industry research institute. Dr. Richard Berry, coordinator of the nanotechnology effort at FPIInnovations, is guiding that initiative.

An industrial-scale demonstration plant, with production capacity of tonnes per week, is presently under serious consideration by FPIInnovations, industry and government.



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"NCC has progressed from a scientific curiosity in university labs into a transformative technology for the forest products industry," remarks Dr. Ron Crotogino, Paprican's Manager, University Partnerships. "It has emerged as a key building block for a new Canadian bio-economy based on innovative, highly-engineered, carbon-neutral products from a highly renewable resource."

Propelling the industry's enthusiasm is Canada's unequivocal world leadership in NCC technology. This coveted stature, says Dr. Crotogino, is in large measure due to the fundamental discoveries of university researchers, particularly those who are highly attuned to industry needs through their long-standing relationships with Paprican.

4. Research on Bugs Producing Considerable Cost Savings for Newfoundland's Largest Forestry Company and its Provincial Government

Thanks to a partnership with researchers at the University of New Brunswick, Newfoundland's largest forestry company is gradually gaining the upper hand on costly insects that can devour as many trees as the company harvests each year.

In western Newfoundland, hundreds of millions of dollars in forest resources are constantly threatened by defoliating insects. Depending on the severity of the outbreaks, these pests will devour and kill as many trees as are harvested by Newfoundland's largest forestry company and the region's biggest private sector employer, Corner Brook Pulp and Paper Ltd. (CBPPL), a division of Kruger Inc.

Fortunately, CBPPL and Newfoundland's Department of Natural Resources are gradually gaining the upper hand on these costly bugs, thanks in large measure to a series of NSERC-funded collaborative R&D (CRD) projects led by Dr. Dan Quiring, a population ecology entomologist at the University of New Brunswick (Fredericton).

With funding from the company and the province, Dr. Quiring, along with scientists at the Université Laval (Dr. Eric Bauce) and the Canadian Forest Service (CFS) (Drs. Lucie Royer, Johanne Delisle and Christian Hébert), recently completed a three-year, \$240,000 CRD investigation into hazard ratings for the hemlock looper—a caterpillar defoliator that can kill conifers in two years or less.

A key discovery, says Quiring, is that the looper's eggs are vulnerable to parasitism during the spring. This finding, he explains, has huge implications for the timing of sampling activities that feed into decisions about where to conduct aerial spraying of *Bacillus thuringiensis* (Bt), a bacterium that annihilates caterpillar defoliators like the looper and the infamous spruce budworm.

Stephen Balsom, Planning Forester with CBPPL, says Quiring's team has provided the company and the province with valuable decision-support information.

"These research findings have helped the province fine tune its Bt spray program, particularly to avoid unnecessary spraying. With better decisions about spraying we can save a lot of money, because it is very costly."

In Newfoundland, the cost of selective Bt aerial spraying to combat the looper can range as high as \$2 million annually. CBPPL must shoulder the cost of applications to portions of its two million hectares of timber limits.



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Hubert Crummey, an entomologist with the provincial Forest Insect Control Program, says the findings of Quiring's team have allowed for better assessment of potential infestation for the following season. "This research has already produced considerable savings. It's an easy trade-off between spending millions on biological treatment or spending thousands to get really good information from the university researchers."

New Engage Grants Program Helps Companies and Academic Researchers Connect on Short-term R&D Projects

As a business person, you may have considered working with academic researchers as a way of advancing your R&D and giving your business a competitive edge, but you were not ready to take the plunge into a full-blown partnership without first testing the waters.

Through a new program called Engage Grants, NSERC has now made it easier for companies and academic researchers to work together on short-term (up to a six-months duration) research projects that address a company-specific problem. The program will help foster new relationships between companies and academic researchers.

What's more, NSERC provides the funds for this relationships-building exercise to take place. The program awards up to \$25,000 to cover the direct project costs.

As a business, you can't lose—the project is aimed at helping to solve your research problem, and your company enjoys the added bonus of keeping the rights to any intellectual property arising from the project.

What better way to see if an R&D partnership is right for you?

For more information on our Engage Grants Program call one of our regional offices toll free at 1-877-767-1767.

NSERC's New Business-friendly Policy on Intellectual Property

Effective December 1, 2009, NSERC has revised its policy on intellectual property (IP) that gives more flexible access to IP developed as a result of NSERC funding, while at the same time ensuring that the rights of all participants are protected. NSERC's Policy on Intellectual Property promotes the use or exploitation of knowledge to build a strong national economy and improve the quality of life of Canadians.

For more information on NSERC's IP policy, go to http://www.nserc-crsng.gc.ca/NSERC-CRSNG/Politiques-Politiques/ip-pi_eng.asp.



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Trade Secret—How Companies Add Highly-qualified Workers to Their R&d Team at Minimal Cost

Did you know that more than 500 Canadian businesses hire students and postdoctoral fellows each year through NSERC's [industrial scholarships and fellowships](#)? By doing so, they add highly skilled bench strength to their in-house R&D functions at minimal cost. Last year, companies took advantage of these programs to hire close to 1,500 students and fellows.

Share your story

Have an NSERC R&D Partnership success story to share? Please send a brief summary to editor@NSERCPartnerships.ca.

Contact Us

For more information about NSERC's partnerships programs and how your business can become involved and benefit, please call toll free at 1-877-767-1767. You will be connected to a representative in one of our five regional offices who can assist you.



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