Council Election • Benevolent Fund and Foundation Donors • Disciplinary Notices • Branding Update

JOURNAL OF THE ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF BC

JULY/AUGUST 2017

Innovation

PM40065271

Making Strategic Research and Development Financing Work

Funding Homegrown Innovation

Improving Flood Preparedness for British Columbians

FUNDING HOMEGROWN INNOVATION

Robin J. Miller

With government R&D funding, Guy Dumont, P.Eng. and his team were able to develop the Kenek02, which allows a mobile app to test for signs of easily preventable but deadly illnesses.

Have a great idea for a new technology, product or process, but lack the funding or expertise to commercialize it? Help is here—but maybe not where you think.

Money! It's the single largest stumbling block to innovation and yet, in many ways, it is surprisingly easy to get—provided you have a truly useful idea and you know where to look. (Hint: it isn't *Dragon's Den*.)

In general, private investors look for projects that guarantee a safe return on their investment: they are less interested in ground-breaking technologies and more in iterations of what has already been proven in the marketplace. And they have virtually no interest at all in simple improvements to existing processes or procedures that may revolutionize one company's way of working but never make it as a commercial product.

That's where government funding comes in.

At both the federal and provincial levels, substantial funding for R&D and innovation is being deployed says David Lisk, vice president of the National Research Council Industrial Research Assistance Program (IRAP), "to help build the innovation-based economy and support the creation of sustainable companies."

The NRC's IRAP specifically supports small and medium-sized enterprises (SMEs) of up to 500 employees "interested in growing through commercializing innovative ideas," says Lisk. "We come in early in the life of the SME and provide advice and funding to help them throughout the lifecycle from idea to product launch."

Other government funding programs (either direct or at arm's length) are aimed at varying aspects and stages of industrial R&D. Some support universities and university researchers in doing fundamental and applied research; others support industry—established companies, as well as startups and entrepreneurs—to investigate, test, develop, and commercialize ideas. Still others support collaborations between universities and industry partners, allowing industry to access some of the best facilities and researchers in the world for a fraction of the usual price, and universities to train their students to solve real-world issues.

Dan Blondal, P.Eng., has taken advantage of a number of government funding programs since he co-founded Vancouver's Nano One Materials Corp. in 2011. Blondal saw an opportunity to improve the way raw lithium is currently processed and transformed into energy storage—a potentially huge improvement for a world that is increasingly reliant on lithium ion batteries in smartphones, Teslas and a multitude of other applications.

To complete the necessary research, Nano One received help from Mitacs, a national, non-profit organization that functions as an R&D version of eHarmony. Mitacs matches private-sector companies that have ideas for processes or products, or are looking for solutions to specific problems, with graduate students or postdoctoral researchers for mutual benefit.

Evaluations "tell us that 92 percent of our partner companies would recommend our programs," says Mitacs business development specialist Nolan Beise, largely, he thinks, because "we approve projects in four to six weeks" and because "academics don't speak 'business' and business people don't speak 'academics.' We are in the middle, making the connections and helping them communicate."

Nano One also applied for and received IRAP funding to "ensure the technology would scale up," says Blondal. "That first major IRAP grant enabled us to work in collaboration with incubator NORAM Engineering and Constructors Ltd., their subsidiary BC Research, and Simon Fraser University's ultra-advanced 4D LABS," which in turn owes its existence to a $7-million-plus infrastructure investment from the Canada Foundation for Innovation. It also "gave us the credibility to take our story out to stakeholders and investors," he says.

Private investors want a safe return on investment, but government investors are less risk-averse. That means great opportunities for BC engineers and geoscientists with ideas to pursue or challenges to overcome.

Now, with help from those investors, NORAM, and two more government funding programs—Sustainable Development Technology Canada (SDTC) and the Automotive Supplier Innovation Program—Nano One has completed construction of a $6-million pilot plant to "prove the production viability of the new process in a full-scale commercial facility."

Government funding, Blondal says, "helped de-risk the scale up from bench to pilot to full operation and what we believe will be successful commercialization, and not just for electric cars."

Blondal has also received IRAP funding for Nano One's next big project: to develop commercially viable cobalt-free cathode materials called high-voltage spinels.

Andrew Bamber, P.Eng., founder and CTO of MineSense Technologies Ltd. in Vancouver, also credits several government funders with helping him take "part of my PhD—which included the idea of applying a pre-concentration methodology to improve how mining companies sense and extract low-grade ore—and commercialize it."

In 2009, Bamber began "looking for a postdoc with some skills in that area" to further explore his idea, and eventually connected with Mitacs to help him find and fund the right researcher. More Mitacs internships followed, along with several Engage Grants from the National Sciences and Engineering Research Council of Canada (NSERC), which help pay for short-term university/industrial partner R&D collaborations up to a maximum of $25,000 over six months. Bamber also took advantage "in the very early days" of the Scientific Research and Experimental Development (SR&ED) Tax Credit, which helps cover salaries, wages, materials, and overhead, and later on of both IRAP and SDTC funding.

"As a start-up," says Bamber, "we had to use these programs because you just don't have enough cash to build the technology and build a business around that technology. It takes time and focus to do them, but you need to persevere and then persevere some more. Commercialization is hard and it takes time, especially with a product like ours. Most investors like light and fluffy projects, like apps, while we are working on industrial technology development, which is capital-intensive with a longer development cycle. But we are getting there."

One good sign: this past February, the company announced $19 million in new venture capital funding for commercialization of the technology. "We have been fortunate to find partners with the vision, appetite, and confidence to be first movers."

While MineSense and Nano One are just reaching commercialization, other BC companies that have received significant government R&D support—such as Hootsuite—are international success stories. Less well known but potentially just as valuable (at least in world health terms) is the Kenek 02, now available commercially in Canada.

Developed by UBC's Electrical and Computer Engineering professor Guy Dumont, P.Eng., working with a team at BC Children's Hospital, the Kenek 02 is a Health Canada-approved, clinically accurate pulse oximeter that connects a person's finger to a mobile device so that an app can test for signs of easily preventable but often deadly illnesses such as pneumonia, sepsis, and pre-eclampsia. Useful here in this country, and a game-changer in poorer countries.

"Hundreds of thousands of women and babies die every year around the world from pre-eclampsia alone—99 percent of them in the developing world," Dumont says. "Our health care system gives good care to patients, but not more than 10 percent of all people on the planet receive our level of care. Instead of working for the 10 percent already receiving good care, why not work for the 90 percent who do not?" The Kenek, he says, "is a low-cost, effective technology for the developing world," especially in remote regions where access to hospitals is limited.

With government R&D funding that included a five-year NSERC Discovery Grant, Dumont was able to bring the oximeter to the stage where Tom Walker, a former medical device company executive who retired to Vancouver from Ontario, heard about it and its life-saving potential. He came out of retirement to found Lionsgate Technologies as a way to attract private investors (including Google) and transfer Dumont's technology to market.

"Discovery funding gives you the flexibility to pursue any idea you want, even risky ideas like this one, that may never reach the stage where they can become a collaboration with industry," says Dumont. "But if you don't do that basic research, if you do not take risks, you will never lead in anything."

His advice: industry and investors "should have continuous watch over what's going on in academia."

Industry should also feel free to approach academia with their own ideas, says University of Victoria engineering assistant

A Brief Guide to Government R&D and Innovation Grants and Tax Credits

Government funding programs (either direct or at arm's length) for industrial R&D and innovation are focused in three areas:

- fundamental and applied research, where ideas are investigated for their viability, usually in a university setting;
- technology development and pre-commercial demonstration, where ideas that have moved beyond proof-of-concept are turned into concrete products and tested in real-world settings;
- the delivery of finished, proven products into the marketplace.

National Sciences and Engineering Research Council of Canada

National Sciences and Engineering Research Council of Canada (NSERC) is Canada's largest funder of natural sciences and engineering discovery research. In addition to supporting graduate students and postdoctoral fellows, and funding discovery research at post-secondary institutions, NSERC encourages research partnerships between post-secondary institutions and industry.

Says Rick Warner, manager of NSERC's Pacific office in Vancouver, "Technology transfer is a contact sport. Call us! We meet with well over 200 companies a year. We're willing to sit down and hear what their technical problems are and figure out how we can help."

NSERC offers a suite of interconnected programs that support short, medium, and long-term collaborations between university researchers and an industrial partner to address a company challenge.

National Research Council Industrial Research Assistance Program

The National Research Council Industrial Research Assistance Program (IRAP) offers direct technical assistance through a network of 255 industrial technology advisors (33 in BC and the Yukon) to small and medium-sized enterprises interested in developing or exploiting new technologies. Industrial technology advisors work with clients from concept to market, and link subject matter experts with other resources as required.

The program also provides different levels of support to help fund R&D or hire youth and new graduates.

Scientific Research and Experimental Development (SR&ED) Tax Credit

This program is a federal tax incentive program administered by the Canada Revenue Agency. Under it, Canadian companies can earn an investment tax credit of 35 percent on the first $3 million (and 15 percent thereafter) in qualifying expenditures, including salaries, overhead, and materials.

Most provinces also offer a SR&ED tax credit. The BC SR&ED is a 10 percent refundable tax credit for private corporations located in the province. The provincial tax credit is calculated first, then the federal SR&ED credit is applied to the remainder of the claim. Startups not yet in a taxable position are eligible.

Projects must be aimed at resolving a technological challenge or uncertainty, must be systematically carried out by qualified personnel, and must result in technological advancement.

Canada Foundation for Innovation

The Canada Foundation for Innovation (CFI) is dedicated to improving the capacity of universities, colleges, and research hospitals to conduct world-class research, and to supporting private-sector innovation and commercialization. "We want researchers to work with Canadian companies and entrepreneurs to help them compete globally," says CFI president and CEO Dr. Gilles Patry. "We fund research infrastructure in support of the full spectrum of research—from fundamental research to applied industry-focused research. It is important to understand that you can't do world-class research without having access to state-of-the-art research facilities."

CFI funding programs include the John R. Evans Leaders Fund, which, Patry says, is "designed to attract and retain the best researchers by providing them access to the equipment they need to get started on a good footing. To help companies link up with universities, the CFI also operates the CFI Research Facilities Navigator, a searchable directory of participating research labs and facilities across Canada that are open to working with business.

BC Knowledge Development Foundation

The BC Knowledge Development Foundation (BCKDF) partners with the CFI to support the development of research infrastructure at BC's public post-secondary institutions, research hospitals and affiliated non-profit agencies.

High profile CFI/BCKDF projects include the TRIUMF subatomic physics lab at the University of British Columbia, and the University of Victoria's undersea observatories, NEPTUNE and VENUS.

Mitacs

Mitacs programs include Accelerate, which will share the costs of student research internships with the private partner (contributions start at $7,500 and are matched dollar-for-dollar; projects with three or more interns and six or more internships get better matching: partner contributions starting at $36,000 get $44,000 in Mitacs matching funds), and Elevate for more complex challenges. With Elevate, the partner provides $30,000 and Mitacs provides $25,000 per year for two years to cover the costs of a dedicated postdoctoral fellow.

Mitacs is jointly funded by federal and provincial governments, more than 60 universities across the country, and a range of research partners, such as Ocean Networks Canada and the BC Bioenergy Network.

Sustainable Development Technology Canada

Sustainable Development Technology Canada (SDTC) works with entrepreneurs to fund cleantech projects, which it defines as "technologies that improve business performance while using resources more responsibly, and that reduce or eliminate negative environmental impact," and coaches cleantech companies to help them move their products through development and pre-commercial demonstration. SDTC receives funding from the Government of Canada, but operates at arm's length from it.

BC Innovation Council

A BC Crown agency, BC Innovation Council (BCIC) supports technology startups and emerging entrepreneurs in such areas as cleantech, information and communication tech, bioenergy, and agritech by providing education and coaching in proven methods for developing promising ideas and achieving successful commercialization. One program, the BCIC - New Ventures Competition, offers startups a 10-week industry mentorship package and the chance to win cash and prizes to help them scale up their ideas.

Automotive Supplier Innovation Program

This program supports small and medium-sized businesses in the research and development of innovative products aimed at helping vehicle manufacturers meet new fuel efficiency, emission, and safety standards, and at addressing growing consumer interest in connected and automated vehicle technologies.