COMPANIES, UNIVERSITIES & HOSPITALS:

Pioneer New Partnership Models

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RE$EARCH MONEY

Sometimes the brightest ideas come from the most unlikely of places. Let's start with the cows. They (well, to be fair, the Dairy Farmers of Ontario) needed access to state-of-the-art research facilities to test new approaches to sustainable animal agriculture.

To do this on their own would cost a hefty $25 million – and that's just for the buildings and equipment. Tack on tens of millions more over the long term for scientists' salaries, pensions, maintenance costs, overhead and inflation. Even the hay isn't cheap these days.

With one of the largest agriculture research farms in Canada, the **University of Guelph** was a logical partner. But its' nearly half a century old Elora Research Station was in dire need of upgrading and money is scarce. A new approach was needed.

"Universities do about 80% of new agricultural research and development (R&D) and bear all the costs of maintaining a research enterprise. The old model wasn't working anymore so we came up with something that's pretty unique worldwide," says Prof. Rich Moccia, the university's Associate V.P. (strategic partnerships).

The new model will see the University of Guelph, the Dairy Farmers of Ontario and the Ontario Ministry of Agriculture, Food and Rural Affairs share not only the bricks and mortar costs, but also the longer term liabilities associated with maintaining and running sophisticated research facilities.

"If we can make this work, we will have sustained investment in the necessary infrastructure and intellectual capacity to drive an innovation agenda for research that will create jobs, wealth and make the sector more competitive – and without trading our soul as a university to pursue the academic and scholarly freedom which researchers need to be creative," he says.

Embracing "Open Innovation"

Across Canada, and around the world, academic institutions are stepping out of their comfort zones to better align their research agendas with the needs of industry and society.

One popular model is not-for-profit consortia that pool the collective R&D strengths of industry, academia and government. This "open innovation" approach combines a company's internal resources with the best external capabilities to identify new ideas, reduce risk, increase speed to market and leverage scarce resources.

The Consortium for Research and Innovation in Aerospace in Québec (CRIAQ) is one such example. It brings together some 50 companies and 30 universities and research centres to give Canada's aerospace companies a technological edge in this fiercely competitive sector.

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> **David Hill,** Scientific Director, Lawson Health Research Institute

Prior to CRIAQ's founding in 2002, bilateral collaboration was the norm with one company partnering with one university on one project. Under CRIAQ, each project must involve at least two universities and two industry partners. Industry decides the topic and the research is done at universities.

Dr. Fassi Kafyeke, Director Strategic Technology at **Bombardier Aerospace**, says this approach leads to faster technology commercialization, partly because members resolve the most contentious issues surrounding intellectual property (IP) before any research begins.

"Some discussions can take upwards of two years to conclude, which can kill a project before it ever gets started," he notes.

One successful technology to emerge from CRIAQ is "out of autoclave" – a new manufacturing method for composite materials that is faster and less costly than traditional processes. It is used to build the Bombardier Learjet 85.

"Some European and Asian countries have come here to study the CRIAQ model and see how they could apply it in their home countries. It gives us a great competitive advantage," says Kafyeke.

Xerox Canada includes open innovation in its R&D mix as well. The multinational launched its first-ever open innovation program in 2007 at the National Institute of Nanotechnology (NINT), a partnership between Canada's National Research Council and the University of Alberta. The partners invest funds, human resources and infrastructure to study materials-based nanotechnologies at NINT in Edmonton and at the **Xerox Research Centre Canada (XRCC)** in Mississauga.

"Open innovation is predicated on the notion that there are people as smart, or smarter, than you who don't work for you. Eventually they're going to try to achieve a competitive advantage at your expense so it is in your interest to harness their talents and skills and work with them collaboratively," says Emechete Onuoha, V.P. Citizenship and Government Affairs for XRCC.

XRCC holds a global mandate to develop the materials used by Xerox Corp. globally. Onuoha says this makes partnering with academic and government research labs a necessity. At any given time, it has active projects with more than a dozen Canadian universities.

"Some of the collateral insights that are associated with scientific inquiry are lost or end up being trapped on the shelves of the corporate lab," he says. "With NINT, we're allowing very talented post-doc researchers in material science to work with our data and our materials to see if they can gain any insights that might ultimately lead to a commercially viable product."

Ericsson Canada is another major player in Canada's research landscape. Its Canadian R&D Centres are some of the largest outside of Sweden and fulfill worldwide mandates in development, testing and support of wireless networks and advanced end-user multimedia services.

In addition to joint research, Ericsson works with universities to build a critical mass of wireless technology expertise aimed at addressing practical industry issues.

"Ericsson was the first company to establish a centre for wireless research at the University of Waterloo," says Dragan Nerandzic, Ericsson Canada's Chief Technology Officer. "Now you see how much research is happening in that area resulting in the establishment of some of the most successful and advanced Canadian companies in that space."

The company collaborates with more than 20 universities, yet worries some exciting developments are happening outside its radar. That's why it launched a new program this year that awards grants for academic projects across Canada that support Ericsson's business priorities.

"We wanted to have a more structured process that is open to more universities to make sure we have access to the best talent and capabilities," says Nerandzic.

From Oil Sands to Oil Seeds

Canada's oil sands companies also recognize the value of collaboration. They spend hundreds of millions of dollars annually to find technological solutions that can lower CO2 emissions, enhance productivity and reduce the industry's environmental footprint.

Cenovus Energy Inc. spends $200 million to support more than 140 current R&D projects. At the University of Alberta, for example, Cenovus funds a graduate student to study biological methods for converting bitumen to natural gas and other hydrocarbon liquids that can be used as a biodiesel feedstock. The company also sponsored a new research chair at the University of Calgary to examine the mechanics of oil sands reservoirs.

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Outside of Canada, Cenovus works with Western Kentucky University to understand the science behind turning bitumen into a new energy source, and with Chalmers University on a $60-million project that would use chemical looping combustion, instead of chemicals, to capture CO2 emissions from boilers.

"Academia is involved in a lot of the things we do where we're trying to solve the fundamental problems about how to make something work," says Mark Bilozir, Director of Technology Development at Cenovus. "In other cases like Western Kentucky University and Chalmers we went there because they have working models that allow us to test things that we couldn't test anywhere else in the world. We are searching the world for answers."

Companies that are interested in longer term research – as opposed to one-off projects – will often sponsor academic research chairs. Industrial partners and the Natural Sciences and Engineering Research Council (NSERC), for example, currently support 170 Industrial Research Chairs across Canada, including Dr. Peter McVetty at the **University of Manitoba**.

Since the chair was established in 2003 with support from Bunge Canada and DL Seeds, Dr. McVetty's team has developed oil seed crops with higher yields, shorter maturity, better disease resistance and premium prices.

"There's a common misconception that working on an industry problem isn't something that requires basic research. That's an artificial distinction since an applied component will often flow from a fundamental research program. The HEAR (High Erucic Acid Rapeseed) chair is an example of how fundamental research can lead to new commercial products," says Dr. Digvir Jayas, V.P. Research at the University of Manitoba.

Jayas suggests a more liberalized approach to data sharing and intellectual property (IP) management can lead to even more success. He is exploring a new model that would allow industry to lead IP commercialization and pay royalties based on sales, rather than selling the technology upfront.

"It's hard to negotiate something when you don't know what it will be worth eventually. Inevitably, universities will think it's worth more than the company. It's one of the reasons these negotiations take longer than they should," says Jayas.

Similar out-of-the-box thinking is happening at the University of Quebec's **National Institute of Scientific Research (INRS)** where companies may donate to the institution's foundation in lieu of paying royalties or licensing fees.

"Too often, universities will spend more money protecting their IP than they will eventually get from royalties," says INRS Director General Dr. Daniel Coderre. "We're putting in place an approach that would allow us to transfer IP faster and at a lower cost, and in return we think it will generate more contracts and more donations to our foundation."

INRS is supporting industry in other ways. It recently partnered with the Kauffman Foundation to offer a new support program for INRS professors and students that provides technology entrepreneurs with the tools and skills needed to start their own company.

New Approaches to Drug Discovery

Pharmaceutical companies have other reasons for embracing new models of collaboration and investment. The rising costs and longer timelines associated with turning a promising molecule into a regulatory-approved drug has given birth to a mixed model for drug discovery, with big pharma partnering more with university-based drug discovery groups to take early research to a more advanced stage.

In 2010, **Merck Canada** committed to invest $100 million over the next five years in Quebec-based academic institutions and companies. Half the money will be used as venture capital for early-stage biopharmaceutical start-ups. A significant amount of the remaining $50 million will go to major academic research centres and industry-academic consortia in Quebec.

Merck has already invested $6 million in the Quebec Consortium for Drug Discovery (CQDM) and $6.8 million in AmorChem, a life sciences venture capital fund. In collaboration with Lumira Capital, Teralys Capital and other partners, Merck announced in March of this year a $35-million investment in the Merck Lumira Biosciences Fund, to support early stage life science innovation in Québec.

At CQDM, companies set the research direction, decide which projects get funded and have non-exclusive first rights to license any new technologies. A mentor from each company also works with academic researchers to ensure projects align with industry needs.

"The mentorship is important," says Jennifer Chan, V.P. for Policy and Communications at Merck Canada. "It provides an opportunity for pharma to provide their subject matter expertise and for academic researchers to benefit from this shared knowledge."

Further announcements are pending this fall. "The next phase of our investment commitment will look at partnerships with the major academic research centres in Quebec," says Chan.

Another paradigm shift has been the exodus of clinical trials from North America to low-cost countries. It's driving Canadian hospitals to come up with creative ways to compete.

"We used to compete with two private companies in Sherbrooke for clinical research contracts," explains Dr. Serge Marchand, the Scientific Director at **Sherbrooke's university hospital (CHUS)**. "I sat down with these companies and we saw that we could attract more trials by joining forces. We now have a big pharma company that is interested in collaborating with us."

In May, the partners launched a web portal that provides both pharma companies and patients with an online window to clinical research in Quebec's Eastern Townships. People with lower back pain, for example, can register their interest in participating in a trial, and a company can see how many people are available for a study.

CHUS also collaborates with research centres across the province to compete globally for multi-centre clinical trials. "We can pull everything together and recruit patients in Montreal, Québec, Sherbrooke and elsewhere in the province for larger, integrated clinical trials."

Some trials are initiated by industry; others by hospital investigators. Then there are companies like GlaxoSmithKline which invite scientists to submit ideas that align with the company's research priorities. In all cases, it's important to involve industry partners early in the process, insists Dr. David Hill, Scientific Director, **Lawson Health Research Institute** in London Ont.

"It's a way for us to insert our ideas into the company's R&D plan," he explains. "It may be an alternative use for an existing drug or an underserved population the company hasn't had the time or intention to focus on – adult drugs prescribed off label to children are a classic example."

Lawson also conducts joint R&D with industry. One of its more notable successes is an imaging software that colour codes the speed of blood. It can be found in every CT scanner that General Electric sells globally, generating about $1 million annually in royalties for the hospital.

"The biggest obstacle to industry-academic collaboration is communication," adds Hill. "Recognizing how we can help industry and industry recognizing that there are more ways that hospital research can be useful for them, other than participating in an industry-led trial as a recruitment site."

Dr. Patrick McGrath agrees. The Integrated V.P., Research and Innovation, at the **IWK Health Centre** and **Capital District Health Authority** in Halifax, says the declining number of clinical trials across North America combined with the industry's reluctance to fund riskier research means hospitals need to look for new partnership opportunities.

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Sometimes that means collaborating with smaller companies. For example, the IWK is conducting a small clinical trial with blueberry growers in Nova Scotia to study whether drinking blueberry juice can slow the progression of macular degeneration, the leading cause of vision loss and blindness.

The IWK Health Centre is also incubating biotech start-up DeNovaMed which will begin clinical trials within two years on a new class of antibiotics to fight drug-resistant superbugs like MRSA.

"Is this a new model when we have their employees working in our facility because they're still in incubator stage? Yes I guess it is," says McGrath. "We collaborate where it makes sense."

How to Get Industry's Attention

Companies often attend scientific conferences and monitor scientific journals to keep abreast of the latest academic research. What caught the attention of one Canadian company was a 2009 paper led by researchers at **St. Joseph's Healthcare Hamilton** proving how a single test could rapidly and accurately detect 19 different respiratory viruses, including influenza (H1, H3 and B) and the common cold. The tests inventor Dr. James Mahony says hospitals could save up to $1 million annually if they implemented the test widely. The company is now working with Mahony to further commercialize the technology.

"This company mostly develops standard bacterial culture and antibody tests, but had nothing in molecular testing. We've now been working with them for a year to develop a menu of eight or nine different virus and bacterial tests. We may form a start-up company through McMaster University or the company may set up a new division or an entirely new company," says Mahony, who heads St. Joseph's Virology and Chlamydiology Laboratory.

Mahony's track record is impressive. In 1988 he developed the first molecular test for Chlamydia trachomatis, a sexually transmitted pathogen. More recently, he developed tests for the SARS, H1N1 and West Nile viruses. His lab also developed techniques that inhibit respiratory viruses from multiplying inside cells, which would give health professionals a powerful weapon in preventing a pandemic virus from spreading.

While developing these technologies is never easier, he says it can be an even greater challenge bringing them to market. "Big pharma companies are getting out of the game and waiting for small companies to do the development and animal trials. Then they'll buy the company and move into human trials," says Mahony. "We could go the venture capital route but that's also difficult these days."

Getting to Know Each Other

If companies aren't knocking at your university door, try a little speed dating. That's what the **University of Victoria** had in mind when it launched its Taste of UVic events where faculty members meet with industry representatives to discuss their latest research. It was at last year's event where a major pharmaceutical company learned about a ground breaking technology that isolates genes from Arctic bacteria and then uses them with pathogens to construct bacterial vaccines that reduce the need for antibiotics and diminish the risk of bacterial infection. The discovery has led to a new start-up company and the phama company has licensed the technology for use in a specific field of use.

IWK Health Centre and blueberry growers in Nova Scotia are studying the effects of blueberry juice in slowing the progression of macular degeneration.

"We're making a real effort to match the right company with the right professor so we're not wasting anyone's time," explains Brent Sternig, President and CEO, UVic Industry Partnerships.

UVic also takes advantage of an NSERC program designed to foster new relationships between companies and academic researchers. ENGAGE grants of $25,000 enable companies to work with a researcher on six-month projects. Companies aren't required to provide cash up front and they own any resulting IP.

"These projects give industry an opportunity to work with a university to see how that relationship can benefit them, which can open doors to much larger projects," adds Sternig.

UVic's V.P. Research Dr. Howard Brunt says it represents a new way of doing business with companies. "The days are over when universities tried to hold onto all their IP and then flog it with industry. We need to work with industry to understand what they need and how we can help."