

The Scientist

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On the Up

Ontario has always been known for its groundbreaking science—now get ready for its biotech.

By Kirsten Weir

Ontarians are proud of their scientific history. As all Canadian schoolchildren learn, Frederick Banting and Charles Best discovered insulin in Toronto in 1921. Forty years later, Ontario Cancer Center researchers James Till and Ernest McCulloch proved the existence of stem cells. The first commercial vaccine for childhood meningitis was developed at the National Research Council in Ottawa in the 1990s, after 3 decades of work. And the list goes on.

The hub of Ontario science is the University of Toronto, third in the world in published research. Adding to this distinction, between 2003 and 2006, University of Toronto researchers spun out 16 new companies, helping the university rank fourth for commercialization among public universities in North America. This same trend is present throughout the Province, where pharmaceutical research and development spending has doubled over the last 10 years. Now, more than 800 life-science companies provide paychecks to more than 40,000 employees and bring in over \$14 billion in annual revenues. And with a new multimillion-dollar initiative and favorable tax environment, the Ontario government plans to boost biotech even further.

“Overall in Canada, health biotechnology is a traditional strength,” says Peter Brenders, the president and CEO of the Industrial Biotechnology Association of Canada (BIOTECANADA). “And Ontario is a leading jurisdiction.”

Corey Nislow and his wife Guri Giaever, both researchers at the University of Toronto’s Donnelly Centre for Cellular and Biomedical Research, agree. They left Stanford University in California to come to Canada together in 2006. “We had pretty high expectations before we came,” Nislow says, and they haven’t been disappointed. “The quality of science done at U of T and in our department is on par with any of the top institutions.”

Inside the University of Toronto and beyond, Ontario’s life-science sector is gaining momentum. The field may still be a bit young, but that doesn’t mean it’s feeble. “On average, Canadian companies are at an earlier stage than one sees in Boston or San Francisco. The quality of these companies and what they offer, however, rivals early development firms in any world jurisdiction,” Brenders says.

“We have strong basic research, entrepreneurial business expertise, and a proven history of developing world-leading technologies and companies,” he adds. “Thanks to the partnership and commitment of both the private and public sectors, Ontario continues to be a strong and growing biotech region.”

Discovery Zone

The United Nations regularly lists Canada among the top 10 countries in which to live and prosper. (Last year it ranked fourth, while the United States slipped to 12th.) In February,



the Economist Intelligence Unit ranked Toronto the fourth most livable city in the world, a fact that encourages the world's top scientists and business leaders to settle there.

It's also a place where citizens support research. In December, a poll by BIOTECANADA found that 89 percent of Canadians believe the country should be a leader in global health research. The poll also revealed that Canadians would support spending 20 percent of all health-care dollars on medical research, although the current figure is less than 1 percent. Clearly, Ontario's citizens aren't just focused on their illustrious past. Ontario boasts the third-largest life-science cluster in North America, after Boston and San Francisco/Silicon Valley. The province has one of the highest rates of post-secondary graduates among industrialized countries, churning out some 29,000 post-secondary grads in math, science, and engineering every year.

More than 30 medical research facilities exist in a corridor that extends between two Ontario cities, from London in the west to Ottawa in the east. Forty percent of Canada's leading pharmaceutical companies are located in Ontario. And pharmaceutical research and development spending in Ontario doubled over the last 10 years to almost \$550 million.

Ontario's most familiar ambassador is Toronto, the provincial capital and the largest city in Canada. With 2.5 million people living in the city itself, and 5.5 million in the greater Toronto area, more people live in the shadow of the CN Tower than in all of Canada's four Atlantic provinces combined. The city is also one of the most diverse in the world. Its streets hum with the voices of more than 100 languages, and half of all Toronto residents were born outside of Canada.

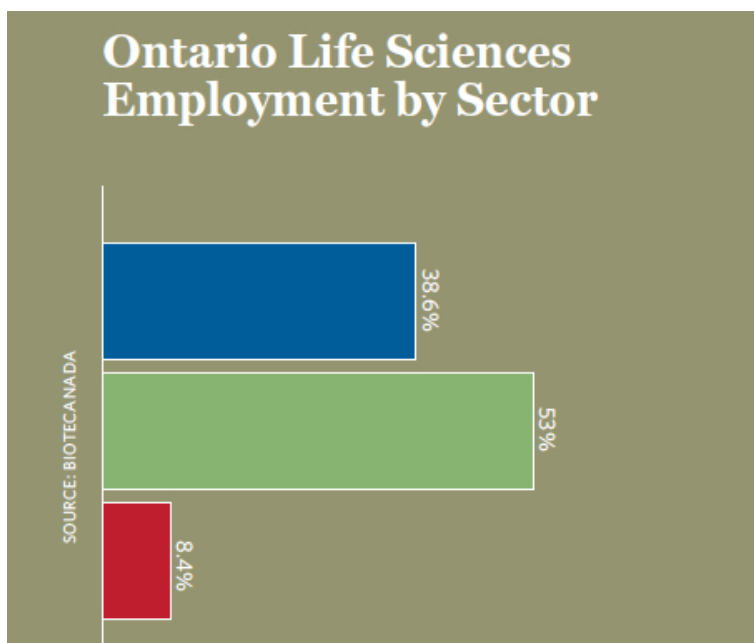


A reflection of the CN Tower in Toronto

Unsurprisingly, many of Ontario's companies and research centers are located in Toronto's bustling downtown, in a 2.5-square-kilometer area called the Discovery District. Among the district's heavy hitters are the research institutes associated with Mount Sinai Hospital, Sunnybrook Health Sciences Centre, the Hospital For Sick Children, and the University Health Network (UHN). The UHN group is made up of Princess Margaret Hospital, Toronto General Hospital, and Toronto Western Hospital, which together constitute the University of Toronto's largest teaching hospital.

The University of Toronto is the centerpiece of the Discovery District, with an urban campus located just steps away from Queen's Park, the site of the Ontario Legislative Building. According to the Times Higher Education Supplement, the university is one of only five in the world ranked among the top 16 for all fields.

Just a few blocks down University Avenue is MaRS, a nonprofit corporation founded in 2000 to help commercialize Ontario's research. Housed in a prominent historic building that was once part of Toronto General Hospital, the MaRS Centre puts a very public face on that effort. MaRS's brick-and-mortar building provides offices, incubator space, and lab facilities for some 70 tenants, from next-generation start-ups to established global companies such as Glaxo SmithKline.



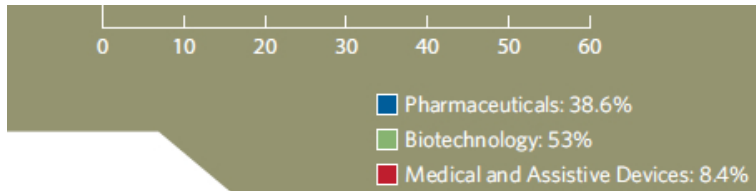
Life Science Corridor

With the University of Toronto and MaRS serving as such high-profile examples of Canada's scientific expertise, it's almost too easy for Toronto to hog the spotlight. In reality, research pockets exist across the Province, from London to Waterloo.

Consider the International Barcode of Life Project, which owes its existence to University of Guelph biologist Paul Hebert. In 2003, Hebert proposed DNA barcoding as a way to identify species. Today, researchers around the world are amassing a database of species barcodes and using the technique to classify organisms. Guelph remains a key player, with a new facility that can identify more than 100,000 specimens per year.

Ottawa is also a nucleus of research activity. Though it's a smaller city than Toronto, with a population of just over 1 million, it's also the nation's capital. As the seat of government, it is home to national museums and cultural offerings, as well as a number of government labs.

"Here in Ottawa, we have a unique blend of industry, academics, and government," says Rafal Iwaszow, product development



manager at DNA Genotek, an Ottawa company specializing in the collection and stabilization of human and animal genetic samples. That blend, he says, “brings a lot of interesting people to the area. We do a lot of collaboration with these groups, and it’s great to have them right in your backyard.”

Laura Trinkle-Mulcahy, who studies phosphatase regulation at the University of Ottawa, is a relatively new transplant to the city.

After completing her PhD in the United States, she spent her postdoctoral years at the University of Dundee in Scotland before being “lured west” to Ottawa. She says she was impressed with the University of Ottawa’s ambitious but thoughtful approach towards expansion. “They’re looking to expand, and they’re looking to do it in a structured way. They’re saying, ‘Let’s get people together in institutes, let’s put together core facilities, let’s really make a push to build up the research here,’” she says. “Certainly, they’ve been doing strong research for decades, but what’s changing is the way research is done. Now it’s much more interaction, and [interdisciplinary] collaboration is encouraged.”

A Growth Environment

Ontario’s government is undertaking efforts to cultivate the region’s life-science sector. In 2008, Ontario’s premier, Dalton McGuinty, launched the Ontario Innovation Agenda. A cornerstone of that agenda is the Next Generation of Jobs Fund, which will invest \$1.15 billion to create new knowledge-based jobs.

Ontario also offers a favorable tax environment designed to lower business costs and maximize the province’s research potential. Thanks to an extremely competitive research-and-development tax credit, for example, the after-tax cost of a \$100 R&D expenditure can be less than \$37. A recent study found that in 2005, Ontario’s tax support for both large R&D performers and small companies ranked first among G-7 countries.

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For scientists in the public sector, the primary funding source is the Canadian Institutes of Health Research (CIHR), the equivalent of the United States’ National Institutes of Health. Nislow, who moved to Toronto from Stanford, has found that Canadian funding levels fluctuate less than those in the United States. “Of course, we all want more money, but [the funding in] Canada seems to be more steady,” he says. CIHR funding success rates are also higher: around 20 percent of CIHR grant applications are funded, versus sometimes single-digit success rates for NIH grants. “What that means from a practical point of view, in my opinion, is that good grants get funded,” Nislow says.

In Canada, he adds, “the funding success rates are higher, the dollars per grant are lower, so a typical well-funded lab might have three grants.” But the lower dollar figures aren’t necessarily limiting, Nislow says. In fact, they often inspire creative solutions. “People tend to pool their resources to tackle a scientific project,” he says, contributing to a more collaborative environment.



The view of Parliament Hill in Ottawa

Culture of Collaboration

Indeed, many researchers working in Canada are quick to point out the collaborative atmosphere. “I moved here and got emails from two cell biologists welcoming me to Canada’s cell biology field, and [asking] if I needed any help or advice,” says Trinkle-Mulcahy, the cell biologist who relocated from Scotland. “Canada is certainly a huge area and yet it feels small.”

She was also impressed with the resources available to assist new investigators. Each year, for example, the CIHR holds a weekend meeting for new principal investigators to come together, share war stories, sit on faux grant-review panels, and receive advice from

scientists who have been leading labs for years. “CIHR is making a point: We’ve hired these new professors, and we want them to be successful,” she says. “It’s extremely supportive, and I hadn’t come across anything like that in the States or the U.K.”

Shana Kelley, a biochemist at the University of Toronto, studied and worked in San Diego and Boston before moving north, so she’s familiar with being located near thriving scientific centers. But to her, Toronto stands out. “This is a community that is chock full of really spectacular physicians, clinicians, scientists, all of these people that have the clinical expertise that people like me really need. The clinical community here is very open to collaboration,” she says. “The same kinds of communities exist [elsewhere], but I don’t know that they’re as open as the one here.”

Nislow chalks up that supportive spirit, in part, to the Canadian sensibility. “There’s a civility,” he says. “I think there’s a cultural element to it. The environment is extremely collaborative.”

When Nislow and his wife relocated, he says, they were challenged to find an institution that would accommodate both of them. “There is the two-body problem with scientific couples,” he notes. But the University of Toronto “didn’t see it as a problem; they saw it in a very positive way.”

He argues that most first-rate institutions in the United States are reluctant to take on more than one mouse expert, one fly expert, one yeast expert. Not so in Canada, he says. There are six yeast geneticists or genomicists in his building. “We don’t step on each other’s toes. On the contrary, there’s really an amazing critical mass of people working on related problems,” he says. “The latest thing in science is to build ‘centers of excellence’ at different institutions. It seems to me like [Toronto] has hit on one way to do that.”

International Meeting Place

Ontario’s prime location also works in its favor. Ontario shares more coastline with the United States than any other Canadian province. Toronto and Ottawa are both short flights from Boston, New York, and Washington, DC, and Montreal is a drive away. “We’re in such close proximity to all these other sectors, which lets us draw on resources and make some great collaborations,” says DNA Genotek’s Iwaszow.

Canada’s scientific community draws top researchers from around the globe. Rajeeb Gautam came from Australia to Ontario as a graduate student in the 1990s, and today works as a project development manager at the biopharmaceutical company Bioniche Life Sciences in Belleville.

“I had options in the US, Australia, many different places. [In Canada] there were lots of scholarships, lots of funding for new research activity. On top of that, I chose Ontario because Toronto provided a really good hub for any kind of career growth opportunities,” says Gautam.

Toronto’s status as a global biotech center brings unique opportunities to the region, he notes, with “conferences, seminars, meetings, and gatherings almost on a monthly basis.” At a recent meeting, he bumped into an old colleague from Australia that he’d lost contact with a decade earlier. That only happened, he says, because Toronto is truly an international meeting place.

Since moving to Canada, Gautam has lived in Toronto, London, and now Belleville. He’s enjoyed them all. “Ontario is a very good place for job opportunities. There’s such a huge cluster of companies [and] so much variety. Because of that there is a good collaborative opportunity, and partnership opportunities are always there,” he says.

“Ontario has so many things to offer for newcomers, or for those who are already established here,” he adds. “It’s a great place to live and work.”

A Success Story

By Kirsten Weir

In just 6 short years, Cameron Piron’s company has grown from three employees to 140, sells its products around the world, and has revenue “well into the tens of millions,” Piron says. He co-founded Sentinelle Medical in 2004 around his work improving breast MRI systems as a master’s student at the University of Toronto. Clearly, a number of factors contributed to that success. But the company’s location in Toronto, Ontario, certainly hasn’t hurt.

When Piron started in the field, using MRI to find early-stage breast cancers wasn’t a well-proven principle. “I was trying to make breast MRI a really effective clinical tool,” he says. When the time came to spin his research into a company, he took a hard look at where best to locate it. He considered moving to Milwaukee, Wisconsin, where an MRI research cluster already existed.

Ultimately, Piron and his co-founders decided they had good reason to stick close to home. “It made a lot of sense to be near the research institutions that really helped spawn the technology,” he says. In fact, Sentinelle still maintains partnerships with research hospitals and university labs that help develop and test new products.

Canada’s investment programs also helped Sentinelle to flourish. “For an early stage company, there’s a huge number of benefits of doing business in Ontario,” he says. Chief among those were incentives for research and development. Piron cites government programs like the Ontario Innovation Agenda and favorable tax structure for research and development as instrumental to Sentinelle’s success.

“The need for technologies to apply quality health care at lower cost is really astounding, but these new companies are being choked out of the new market because they don’t have the access to capital. So a lot of these [government] programs are really essential,” he says.

Sentinelle currently invests an aggressive 50 percent of its spending on R&D, Piron says. As a result, the company already has 16 products on the market. “I think we’d have half that without the [governmental] support we’ve received,” he says. “There’s a great incentive in Ontario and also in Canada to spend a lot of money on R&D to drive new products – and in an emerging market like medical imaging, that’s exactly what we need to do.”



Fast Facts:

- Ontario boasts the third largest life-science cluster in North America, after Boston and San Francisco/Silicon Valley
- This year, the Economist Intelligence Unit ranked Toronto the 4th most livable city in the world
- The Province churns out nearly 30,000 post-secondary grads in math, science, and engineering every year
- Ontario is home to more than 800 life science companies, employing more than 40,000 people and bringing in over \$14 billion in annual revenues
- Toronto is known for its diversity—half of all residents were born outside of Canada
- Thanks to an extremely competitive research-and-development tax credit, the after-tax cost of a \$100 R&D expenditure can be less than \$37.