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Universities debate ethics of private-sector funding

As government funding shrinks, universities are turning to industry for research money. Some academics fear they'll lose independence; others say the synergy of co-operation helps both partners accomplish more than either could alone.

DOUG SWEET
The Gazette

Hooked to a pair of flexible steel hoses, the probe looks like a six-inch syringe that you wouldn't dare stick into an elephant. But on this day it is shoved harmlessly into a plastic bottle of Hershey's chocolate syrup.

The hoses are plugged into a stainless steel box. Inside that box is a bit of technological wizardry that has drawn Hershey and other companies, such as Frito-Lay, to spend money at McGill University's Macdonald campus in Ste. Anne de Bellevue. These funds have helped develop the largest infrared food-analysis laboratory in North America.

Welcome to the world of synergy, where one plus one can equal three. Here, companies can get universities to do research at a fraction of what it would cost them to hire staff and equip labs of their own. This is where universities gladly gobble up the dollars that industry is often eager to provide. It is money that keeps research alive, professors employed, graduate students fed.

But there's a growing debate among academics over who calls the shots on research performed at or by a university. Tough questions are being asked.

If a company pays for a research project, can it then demand that the university desist from publishing the results so as not to tip off a competitor?

Can a company dictate the scope or limits of research so that activity is focused narrowly on the results it wants for a specific product or process?

Should universities, in the name of academic freedom and independence, sneer at corporate money that can help employ students as researchers and give them valuable experience and future job prospects?

Hold it, say those who are much more sanguine about private-sector support of university research. Corporate funds can form an important part of the support system for graduate students, they argue, lead to practical training that can help equip students for the real working world and lead to scientific and technological advances that, if pursued separately by universities and industry, might never be realized.

The stainless steel box in the McGill food-sciences lab houses an infrared spectrometer - a device that lets scientists record something as small as a vibrating molecule.

Why are companies like Hershey and Frito Lay interested in that box and the fibre-optic probe that goes with it? The probe, being developed in the food-analysis lab run by professors Ashraf Ismail and Frederick van de Voort, could help Hershey analyze the sugar profile of its syrup or Frito Lay the state of its cooking oil.

Using infrared spectroscopy, Hershey could check its syrup for the proper mix of sugars and other components as it is made and make adjustments without disrupting production .

The same technology can be used in making potato chips. Because cooking oil begins to taste bad once it oxidizes, Frito Lay is interested in checking the molecular structure of its oil during cooking, to try to avoid oxidation and have the oil last as long as possible.

Scotch-tape maker 3M is a contributor to this project, as are a number of high-tech companies.

So is the federal government, through the Natural Sciences and Engineering Research Council, better known as NSERC (pronounced EN-surk). It is one of three main funding bodies, the other two being the Medical Research Council, better known by its initials, and the Social Sciences and Humanities Research Council, also known by its initials and pronounced shirk. No pun intended.

As Canadian government funding for "pure" or fundamental research has declined sharply since 1994, with further cutbacks planned, universities have turned increasingly to other sources of funds. For the sciences or engineering schools, that usually means hooking up with a private company interested in practical, marketable and profitable results. Fast.

McGill, for example, has seen its funding from the three main granting agencies decline to a total of $54.6 million in 1996-97, from a peak of $59.2 million in 1994-95, according to the office of graduate studies and research.

Meanwhile, funding from industrial sources, both foreign and domestic and in the form of grants and contracts, has virtually doubled, to $11.7 million in 1996-97 from $5.9 million in 1993-94.

The reduction of government funding (NSERC has seen its budget sliced to $433 million from $500 million in the last three years, while other industrialized countries have been spending more on research) has affected the way universities are run, said Claire Cupples, chairman of Concordia University's biology department.

"Industry thinks short-term - the quarterly balance sheet," she said. "Academics are looking at three- to five-year research projects."

If impatient businesses pull the plug on research that is taking too long, "this will be hard on the students and have an impact on education, not just on research," she said.

John Gruzleski, a McGill professor of metallurgy and mining, agrees. "In most relationships with most industry, there is the pressure for very short-term results," said Gruzleski, who is himself involved in an award-winning project with a mining company.

Rare is the company prepared to hand a university professor a hefty cheque without attaching a few strings. BioChem Pharma's recent donation of $1.1 million to Concordia University scientists working on an analysis of DNA is a singular exception.

It is the strings that worry some academics. Frequently, these professors are found on the arts rather than the science side, in part because they tend to have had less experience working with the private sector.

"We're sort of heading into uncharted waters," said Bob Roy, vice-dean (academic) at Concordia and a professor of biology. "We're competing more and more for funding from outside from people who are telling us what's important."

But industry and universities often have different priorities and objectives, he said. As well, industries trying to develop new products tend to be far more secretive about their research than a university would be.

"It's hard for students to work on a research project when there's secrecy," Roy said. "And we're being encouraged, even through the granting agencies, to do more 'relevant' research" that will lead to jobs, partnerships and value added.

"I think everyone has pretty much come to the conclusion that we don't have much choice but to forge linkages with the industrial sector. There's some anxiety about that, but I don't see a lot of practical examples yet. Up to this point, it's more an apprehension of a problem."

That apprehension was expressed eloquently by York University historian Michael Horn, who wrote earlier this year:

"The call for market-driven universities has unhappy implications for some of the university's functions: the expansion of the realm of knowledge, the provision of an informed and disinterested analysis of phenomena and events, and the fostering of self-knowledge and an integrated understanding of the world. Not only such roles are in danger, but also the freedom of professors to determine the content of their teaching and the direction of their research."

Gervais Dionne, executive vice-president of BioChem Pharma, a Laval biotech company, believes the days of insulated ivory towers are numbered. As are the days of remote, isolated industrial research labs. The advancement of knowledge, especially in such fields as molecular biology, is proceeding "at a pace which is incredibly fast. I think nobody will be able to do it all by themselves."

People like McGill's vice-principal of graduate studies and research, Pierre Belanger, and NSERC chairman Tom Brzustowski emphasize that universities should strike a balance between applied, practical research that produces concrete results and pure research that may never have a practical use.

"Perhaps a lot of people at universities don't understand that," Belanger said. "Remember, Pasteur and Archi-medes were working on practical problems" when they discovered pasteurization and the law of displacement.

"There is certainly nothing wrong with an engineering professor working on applied research," said Belanger, a former dean of engineering. "I think that's part of their job, frankly. You still have to have that fundamental part - that is really the core that the university should be doing. That's what the government has to fund."

Addressing the Montreal Board of Trade this month in the first of a series of speeches nationwide to drum up public support for increased government support for research, Brzustowski also emphasized the need for balance.

"Doing world-class basic research gives us access to discoveries all around the world . . . and provides the source of ideas for radical innovations in the future," he said. "Project research uses new knowledge to solve problems that we already face, most of them in industry. It teaches us how to use knowledge productively, and helps keep our products competitive in today's markets."

Are universities swinging out of balance when it comes to research funds?

No, said Alex Navarre, director of McGill's Office of Technology Transfer, which sets and polices the rules under which professors and industries can work together. "My feeling is that we are very far from having industry controlling the university."

McGill jealously guards the right to publish the results of its research, something that has cost it a number of potential contracts or grants from industry, Belanger said.

"People aren't aware of the lengths to which we go to enforce the university's mission when we do a contract," he said. "We go to great lengths to preserve the right to publish and we have turned down contracts when that was not allowed."

McGill's guidelines for accepting contracts and grants from industry are under review. A contract, Navarre explained, is between a company and a professor and is for a specific type and amount of work. A grant, often made to a department rather than an individual, tends to permit more freedom for wider-ranging research.

Dionne of BioChem Pharma explained the process from industry's point of view.

"I don't think that industry will dictate the research agenda of a professor," he said. "I don't think that's feasible. If we identify a scientific need in the company, we cannot go and see a professor and say 'you will work on this.' We look for experts in the field. We go and say 'here is what we do; are you interested in working with us?'

BioChem does insist on having a say in the timing of any publication that might arise from research, Dionne said, but only until after applications have been filed for any patents involved.

Ismail, whose McGill infrared group has attracted more than $2 million in industrial funding since 1990, is a fervent proponent of private-sector participation in university research.

"All our graduate students will have a job within a year of graduation" thanks in part to the links forged with industry, he said. "Where is the shame in that? Where's the prostitution?

"We've been successful in attracting more work because we actually produce something that's practical."

Ismail said he respects the concept of intellectual freedom, "but you have to balance it with the realities of today's economy."

About 20 per cent of his budget, provided by NSERC, can be devoted to pure research, he said.

"We collaborate with industry on projects of our own choosing," Ismail said. "I can generate three to four times the funding and I'm not ashamed to say that some of that funding goes to pure research.

"I could go home with 20 per cent of my funding, publish a few papers and live a nice life, but if I want to do more, I have to rely on industry."

One of the industries on which Ismail relies is a small Pointe Claire lubricant manufacturer called Therma-Lube Inc. The company has invested about $400,000 in Ismail's research over the past five years, said president Dave Pinchuk. It helped develop a Continuous Oil Analysis and Treatment system that uses infrared spectroscopy to monitor the quality of oils and lubricants on the job, giving manufacturers a chance to alter their composition before they begin to deteriorate. One system has been sold to the largest oil refinery in the world, in South Korea. The deal was worth nearly $120,000.

Has the research relationship been worthwhile?

"Absolutely," Pinchuk said. "It's a synergy program. The relationship worked very well from both directions." It has led to new products for Therma-Lube to market, caused the company to hire two highly skilled graduate students and it expects to hire more.

"It's a company's objective to be profitable," Pinchuk said. "We can't afford to do it (pure research). Our research has to be focused and it has to be marketable and that's a criterion for government grants. There's pressure from the government that these projects are marketable because they want to employ people and they count on us to pay taxes.

"So it's not only us.

"We have a major influence on what we do. We work out an agenda and a time line together (with the university) that is suitable for both parties."

The Therma-Lube/IR project, one of a number of partnerships singled out in the Conference Board of Canada's 1997 R&D partnership awards program, won an honorable mention. One of the top prizes went to Gruzleski's partnership with Timminco Ltd., an Ontario mining firm.

Thanks to a chance encounter on a Montreal commuter train in 1980, Gruzleski and Timminco have been working together to develop better, less brittle aluminum for casting.

The key to their work is the addition of a metallic element called strontium instead of sodium as a modifier in the production of the aluminum.

There has been a sharp increase in the demand for aluminum castings in recent years, especially from an automotive industry that is looking to build lighter, more fuel-efficient cars.

All-aluminum engines, both heads and blocks, are becoming more common in both imports and domestically made automobiles.

Timminco, a magnesium producer, can produce strontium easily and cheaply.

McGill's research helped the company find the right way to use it in making aluminum alloy, Gruzleski said.

As a result, Timminco is now one of the world's leading producers of strontium, "a very profitable line for the company," Gruzleski said.

McGill does not share directly in those profits, Gruzleski said, because the use of strontium could not be patented.

Another winner in the synergistic sweepstakes is a Montreal film animation company using state-of-the-art computer technology to produce groundbreaking animation that looks almost real.

Working both with the Universite de Montreal and Concordia University, Taarna Studios is building on the success of an award-winning 1985 short film by Pierre Lachapelle called Tony de Peltrie. The company's current project, The Boxer, is a 20-minute animated feature that should be available to theatres later this year.

"We will break the ceiling," Taarna's project manager, Lucie Marchand, said in an interview at the company's incongruous Old Montreal offices. About 35 young programmers and animators work on the newest computer equipment under the wooden-beamed ceilings and within the thick stone walls of one of the oldest buildings on the waterfront.

"We have to train everybody," Marchand said. "That's why it's such an advantage to work with a university."

In Taarna's case, the major benefit of its continuing investment in university film courses is a supply of manpower for its ultra-high-tech 3-D animation films.

The company hires both computer programmers and animation artists and throws them together in a creative environment that produces its own synergy.

It is a rapidly expanding, quickly changing business.

"We just don't have time or resources" to do research and development, Marchand said.

The Universite de Montreal and Concordia do.