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## Mathematics stepping out of the shadows

**Graduate student program gives industry a look at discipline's uses**

By Nicole Strandlund - Business Edge

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COMMENT

It's not all Greek.

Well, some of it is - but that doesn't mean it has to be incomprehensible. Mathematics, with a language of its own and chalkboard-long equations of foreign symbols, has long been cloaked in a Dumbledorian mystique.

But some say businesses may be passing up great opportunities if employers shut their eyes and pretend they don't need to know anything about this discipline.

"It's actually hard to name an industry sector that wouldn't find a mathematician useful," says Arvind Gupta, CEO and scientific director of MITACS (mathematics of information technology and complex systems), a national network of centres of excellence that works to commercialize and apply math techniques in industry and government.

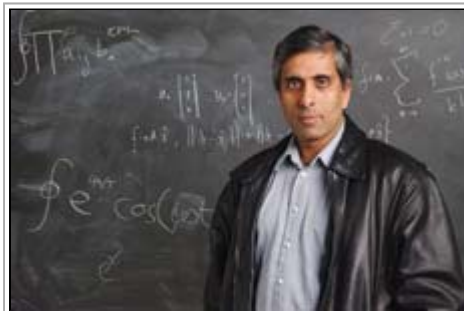


Photo courtesy of MITACS

CEO Arvind Gupta's MITACS intern program has placed graduate students with companies.

MITACS sponsors a program to place math graduate students into internship positions in businesses across the country.

"It's hard to imagine where a math student wouldn't be useful, just because so much technology is mathematically driven," says Gupta. "A fair number of interns have gone to high-tech

companies, whether it's on the pharmaceutical side or the information technology side. But we've actually been very successful placing students in companies that might be considered more primary industries."

The internship program is now in its second year. In 2005, MITACS helped place 100 math interns in banks, financial houses, hospitals, technology



firms and companies in the resource sector. In 2006, close to 200 students will be given internship positions.

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During the program, students remain students at their respective universities. They typically spend half their time with the company and the other half at the university, which is why companies only pay half the cost of the intern.

Aaron Pratt, a University of Calgary student working on a masters in applied mathematics, was an intern at the Calgary office of energy and home-services retailer Direct Energy during the summer of 2005.

The company was interested in examining relationships between natural gas and electricity markets - a project that Direct's on-staff mathematicians were too busy to undertake on their own.

Pratt says he ended up building a co-variance structure of all of Direct's markets (to describe the relationships among commodities), and also studied market volatility.

A degree in mathematics was necessary to do this job, says Pratt. Although the entire project was not all high level, "there was some relatively intense math in it," he says.

Jeff Michnowski, chief risk officer at Direct Energy, says Pratt's work is invaluable. The mathematical model Pratt developed helps the company evaluate the value and risk of its entire portfolio of commodity positions, he adds.

"We've implemented part of what he's helped us with," he says. "It (the model) is very, very beneficial to the company."



Aaron Pratt

The internship program itself, notes Michnowski, was "absolutely" a positive experience. "The company really benefited. I think Aaron himself learned a lot about the business. And the third benefit was bringing that knowledge back to the university ...

It helps us solve business problems, provides experience to the individual and kind of gives us the 'in' at the university. We're always looking for smart people to come in for either intern jobs or possibly full-time jobs."

Steven Pelech, director and chief scientific officer at B.C.-based biotech firm Kinexus Bioinformatics Corp., has also received a math intern through the MITACS program. Sharon Zhao started at the firm in December 2005 and will continue until the end of July. Pelech says the intern experience has been worthwhile, and he intends to take on more.

The company's research is based on better defining protein kinases, essentially the on/off switches for the body's proteins that control all chemical reactions in the body.

Malfunctions of these switches are at the root of cancer, diabetes, heart disease and more, says Pelech. "The work is really important ... (it's) at the crux of the whole concept of personalized medicine.

"The pharmaceutical industry itself really requires this knowledge about protein kinases and what they target. And the information that we're working on, with Sharon's help, is helping to define those molecular targets that can be used both for diagnosis and for treatments."

Pratt, who is still working with Direct Energy even though the initial

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internship is over, says the language and mystique of math are definitely barriers for some.

"I think the reason it's like that is the lack of communication," he says. "People that don't understand it (math) well, kind of view it that way. And the people that do understand it don't bother explaining it very well. So they just allow people to have that view of it."

"As academics, we probably haven't done as good a job of demystifying math," agrees MITACS' Gupta. "What's happened is that we've left that space to either the popular media or popular misconceptions about math. And it's not just about it being hard. There are lots of subjects which students will perceive as hard: Medicine is hard, or engineering is hard. But they don't have trouble attracting a lot of good students into (those disciplines)."

The bigger, more fundamental issue, says Gupta, is that many people believe math won't get them anywhere. "What's funny is that in school, we all learn, 'You should learn lots of math because it's very useful to you,'" he says. "But somewhere along the line that message gets lost" and no one gives concrete examples of where math can be used, so students don't believe the message.



*Photo courtesy of Kinexus Bioinformatics Corp.*  
Director Steven Pelech, in his Kinexus Bioinformatics Corp. office with Keiko, plans to continue to hire MITACS interns.

"I talk to lots of people who say, 'I have a math degree and it's actually been useful, although I wouldn't have guessed it.' Or, 'I'm not directly using it, but it's good training for lots of other jobs,'" Gupta adds. "As mathematicians, if for nothing else than the survival of our discipline, we need to do a better job of communicating that."

Gupta says groups such as MITACS and programs such as the one for interns are crucial for students, business, and most importantly, for Canada.

"A lot of kids leave Canada for the job opportunities" and most of the time it's not about money, but more about finding interesting work,

he adds. "If we don't create interesting opportunities here (in Canada), they'll leave."

After the first two years of the internship program, however, things are looking up. Every single one of the Canadian students who did an internship has stayed in Canada at the completion of their degree. The retention rate has been 73 per cent for foreign students.

"Those are huge changes from what we had before," says Gupta. "It's at least an order of magnitude difference - probably double the number of foreign students, and not quite double the number of domestic students."

After the internship, about half the interns went on to do a PhD, "which is probably the expected number ... but they've gone on to do PhDs in Canada and a lot of them are doing PhDs in very applied areas."

The other half have gone and worked for the company where they did their internship.

Adds Gupta: "These internship programs are creating, I think, interesting job opportunities in Canada, and that's really going to bode well for us."

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