FACULTY OF ENGINEERING | SPRING 2011

Dean's Report

New design pays homage to Canadian engineers' Iron Ring

Ball mills and beanbags lead to a prototype for lunar wheels

OWEN EGAN

The McGill Engineering iRing design is field tested in a mock-up of the lunar landscape.

Planning a lunar road trip? If you are, you'll need wheels that can absorb the impact of the moon's rocky surface without bouncing wildly in its low gravity. And for inspiration to build such a thing, you need look no further than ball mills and beanbags. Especially if you are Mechanical Engineering Professor Peter Radziszewski.

Ball mills are standard technology in mineral processing: ore is placed in a rotating cylinder with metal balls which grind it into a fine powder. "Ball mills absorb energy really well," says Professor Radziszewski, a specialist in mineral processing.

"So we thought, 'What if we fill a lunar wheel with balls?' That would absorb energy, giving great shock absorption, but we would still need to make the tire surface flexible."

Enter the beanbag. The weekend after discussing the potential of a malleable ball-filled wheel with doctoral student Sudarshan Martins, Professor Radziszewski took his son's Spiderman beanbag and screwed a hub through its (cont'd on page 6)






McGill Faculty of Engineering

Dean's Message

There is a common theme underlying several stories in this issue. The iRing research project, our rapidly expanding student services and the Ram Panda alumni profile all show that success is a lot easier to achieve when everyone pulls together.

Our professors, students, staff and, yes, our alumni do not work in vacuums. Each group has a distinctive role and a particular set of responsibilities, but when they work as one there is no limit to what can be accomplished.

Alumni are just as much a part of McGill Engineering as are current students and professors, and that is why we count on you to do your part to help the rest of the team succeed.

Your gifts provide the scholarships, the fellowships, the professional development programs and the upgraded space and equipment in our teaching laboratories that make the system work to its fullest.

A brighter future

Your generosity ensures that everything is in place to bring out the best in our students and professors. And when they do well, you benefit from the shared pride of having contributed to your Faculty's achievements.

McGill's multi-year *Making History* Campaign is entering the final stretch. With 24 months to go, donations to McGill Engineering stand at $65-million. Those dollars came from both annual giving and major gifts, and represent 92 per cent of our Faculty's $71-million goal.

As I said above, nothing exists in a vacuum. The *Making History* Campaign is not an end in itself, but a tool to give literally thousands of current and future McGill Engineering students the means to learn all they need to know to advance in their profession and benefit the wider society that we serve.

If you have not contributed as yet, please think seriously about doing so, and, as always, thank you for your support.

Christophe Pierre
Faculty of Engineering

Alumnus Ram Panda leads by example

"McGill invested in me, so I am investing in McGill"

By Patrick McDonagh

OWEN EGAN

Ram Panda

Ram Panda, MEng'71, MBA'77, is a successful businessman and a committed McGill alumnus, but he was very much a stranger in a strange land when he came to Montreal from India in 1968.

"It was a whole new universe," he says, not only in terms of starting graduate studies in Electrical Engineering, but also coping with a new culture and the Quebec winter.

"I was very fortunate, however, to work with Professor Eric Adler, PhD'66, a kind man who helped me obtain both a scholarship and a position as a teaching assistant. My parents couldn't afford to help me, so without that assistance I wouldn't have made it through grad school."

Panda's gratitude to McGill and Quebec is enormous. "The hospitality I experienced and the level of acceptance I encountered helped me to settle down quickly and integrate easily into Canadian life," he says. "I loved the country. I told myself, 'This is the place to be'."

About a year after completing his studies Panda and a friend saw a business opportunity. The mini-computer revolution had enabled smaller companies to go digital. There was a dearth of software to run on the newly affordable machines, however, so the young entrepreneurs created Planmatics, which offered standardized software packages for industry.

The company eventually focused on metals, pioneering algorithms and methods to facilitate processing and distribution, thereby helping distributors reduce waste and increase profits. The firm has been the dominant vendor in the U.S. since the mid-'80s, and in 2000, renamed Invera Inc., it took on the European market. Today Panda is President of Invera and the firm does business worldwide. *(cont'd on page 5)*

Replacing your lost or damaged Iron Ring

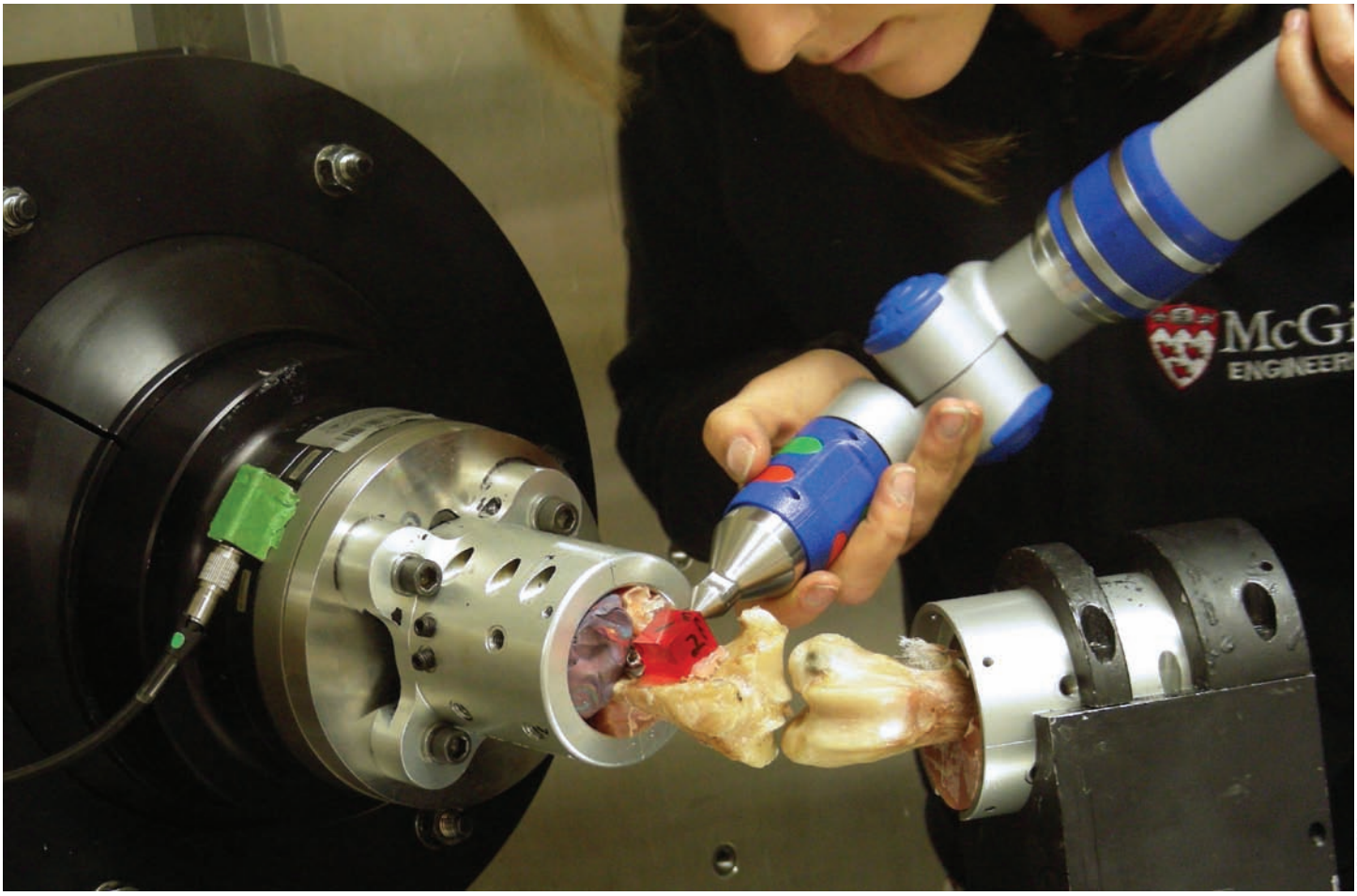
There is a reference in this issue's front page lunar wheels article to the symbolic Iron Ring that many Canadian engineers wear so proudly.

Requests to replace lost or damaged rings have been increasing in recent years, but alumni frequently misdirect their phone calls and emails.

All matters related to McGill Engineering's Iron Rings are handled by our Faculty's Engineering Undergraduate Society, the EUS. If you need information about your Iron Ring, please contact longtime EUS staffer Dianne Ferguson at 514-398-4396 or dianne@mcgilleus.ca. Background on the rationale and history of the Iron Ring is available at www.ironring.ca.

Broadening the scope

Engineering is leading the way for other faculties at McGill



KAREN BODIE

Mechanical Engineering student Karen Bodie interned in the biomechanics laboratory at the University of Calgary's McCaig Institute for Bone and Joint Health. Bodie is pictured here working with a FARO Arm Coordinate Measuring Machine. The institute's goal is to provide pain-free mobility for life. McCaig researchers and clinicians deal with all aspects of patient comfort — employing tools that run from basic science at the molecular level to whole-joint transplants.

The Faculty of Engineering is committed to producing a new breed of professional engineer who is fully equipped to compete in today's global marketplace. To help meet that goal, McGill Engineering offers a broad range of programs and services that complement the academic training undergraduate students receive in the classroom. The intent is to broaden the scope of our students' education so that they leave McGill fully prepared for work in the real world.

This "add-on" professional training is provided through a multi-functional facility called the McGill Engineering Student Centre – MESC for short. The highly successful unit is financed almost entirely through donor gifts.

Besides offering student advising services, awarding scholarships and providing access to research opportunities, the MESC's primary focus is to help undergraduate students learn professional skills, gain on-the-job engineering experience and market themselves more effectively for jobs in industry. For example:

- Industry Liaison Officers organize four- to eighteen-month internships and mentoring programs that expose students to everyday industry situations and practices. Future McGill engineers are given the opportunity to put their academic

STEPHEN COATES

Mining Engineering Co-op student Stephen Coates worked last summer for Osisko Mining Corporation near Malartic, in Quebec's Abitibi region. Coates was assigned to a 55,000-ton-per-day mineral processing complex the firm is building there. He also witnessed the start-up of what is to be Quebec's largest open pit gold mine. The picture of the six-foot-tall Coates speaks for itself.

# of students' educations

knowledge to practical use. They rub shoulders with CEOs and senior engineering professionals, gaining insights into engineering trends and issues and building a network of business contacts to assist them in finding jobs after graduation.

- Workshops and seminars are held every week on topics such as time management, project management, making presentations, communicating to others, group facilitation and rules of etiquette.
- High-profile CEOs and other industry leaders help students focus on career choices through an "Engineers-in-Action Speaker Series" that provides senior managers with opportunities to share their passion and vision for leadership and engineering.
- Coaching and workshops to find employment are provided on topics such as mock interviews, résumé writing and detailed job-search techniques. The program enables students to connect early with future employers and improve their chances of finding summer jobs, internships and permanent employment. The intent is to provide Faculty of Engineering students with a sense of direction and a dose of reality about what lies ahead.

Many of the activities described above are led by industry professionals. In fact, corporate participation is increasing year by year. The number of firms offering internships to McGill Engineering students increased 14 per cent between 2009 and 2010 and is up 26 per cent since 2007. The number of students (cont'd on page 5)

Electrical and Computer Engineering student Uros Simovic interned in Qatar for the multinational consulting firm, Energoprojekt Entel. He is seen here 45 metres above ground during an overhead line insulator site acceptance test. The 400 kV OHL tower Simovic is inspecting forms part of a 21-kilometre transmission line being built for Phase VIII of a Qatar Power Transmission System expansion to meet growing energy demands in the emirate. The line runs from the Ras Laffan C. Power Plant to the Umm Birka Super substation.

UROS SIMOVIC

SARAH WASEEM

Chemical Engineering student Sarah Waseem interned as an environmental monitoring technician at a Teck Metals Ltd. installation in Trail, British Columbia. Teck's Trail Operations facility includes one of the world's largest, fully integrated zinc and lead smelting and refining complexes. The plant produces a variety of precious and specialty metals, chemicals and fertilizer products.

RÉMI DION

Rémi Dion (left) interned for the Wind Energy Institute of Canada (WEICan) at the institute's 38-acre research facility at North Cape, Prince Edward Island. The Electrical and Computer Engineering student worked as a wind system technical assistant responsible for troubleshooting and data analysis. Dion is pictured here with fellow interns Jamie Kilkenny (centre) and Gabriel Gaultier (right) atop a 50-metre-high V47 wind turbine.

Broadening the scope... (cont'd from page 4)

opting for at least one internship during their studies here has also jumped considerably. The participation rate rose from 15 per cent in 2007 to 36 per cent last year.

The MESC's activities have had such a powerful impact on students that other McGill faculties are considering establishing similar, broad-based services.

Faculty of Engineering Dean Christophe Pierre made student services a key priority when he arrived at McGill in 2005, and he says he is proud and gratified that "our Faculty has been recognized for the leading role it is playing in promoting these types of essential student services."

The MESC helps students learn professional skills, gain on-the-job engineering experience and market themselves more effectively for jobs in industry.

"Now that we've shown what the MESC can do, our objective is to build a sufficient pool of endowed and direct-funded gifts to ensure the centre's long-term operation."

Ram Panda (cont'd from page 2)

Panda says that the roots of his success can be traced back to the discipline and grounding he received at university. "That's what allowed us to build a company that's big enough today to give substantial tax revenue back to the public treasury. It gives me great satisfaction to look at the leverage that was created by the small amount of money I received as a student. We have returned so much more to society."

While Panda enjoys looking back on his McGill years, he also has a clear eye on the future.

"I come from a country where people are happy if they can cover the basics of food and housing. But most of us in the developed world have much more than we need," he says.

"We use immense quantities of resources to enjoy things today, but not to build things that will last for the next 100 years, and this approach comes at a great expense to the earth."

Panda is committed to reducing his own ecological footprint, carpooling to work and using public transit regularly. But he wanted to do more to contribute to a long-term solution.

Giving back is key

"That led me to places of learning, especially universities, because they have the means to stimulate change in society. They have reservoirs of knowledge and the intellectual resources to create new knowledge, as well as international networks that connect researchers," he says. "So it was an easy choice: McGill had invested in me, so I would invest in McGill."

And invest he has. For years, Panda has maintained a regular routine of annual giving for general funding in the Faculty of Engineering, stressing the importance of helping the Faculty to maintain its ongoing programs.

And since 2007, he has donated time and energy as a member of Engineering's Faculty Advisory Board, where he articulated his concern for sustainability in engineering practices and then joined with alumnus Lorne Trottier, BEng'70, MEng'73, DSc'06, in providing funding to create the Institute for Sustainability in Engineering and Design (ISEAD). You can read more about ISEAD in the Fall 2010 issue of the *Dean's Report*.

Giving back to society is central to Panda's philosophy. "The concept of supporting important causes has to be inculcated in the next generation," he says.

"I tell my kids, 'If you do well in life, don't forget your obligations to society.' We can each do something, however small, to help to ensure future generations live in a healthy world. If enough people contribute to the effort, I believe we can make a difference."

Ball mills and beanbags... (cont'd from cover)

centre. A prototype was born.

To provide the required flexibility (rubber is too bouncy and would degenerate quickly in a vacuum with high temperature variation), they fixed upon chainmail. And so they came up with the iRing, a chainmail-sheathed wheel filled with a space-appropriate material (or, in a smaller terrestrial model, peas).

The name iRing refers to the looped rings of the chainmail as well as the Iron Ring graduating engineering students receive in Canada.

"The iRing has some interesting advantages," Professor Radziszewski says. "Its traction is equal to or better than that of an equivalent rubber tire, and you can tailor how much particulate you place in the wheel according to how much traction you need."

OWEN EGAN

Doctoral student Sudarshan Martins operates a clear faced ball mill that is used to analyze charge mill motion and validate both mill instrumentation and mill models. The 1.5-metre diameter by 25-centimetre deep ball mill is housed in Professor Peter Radziszewski's basement lab in the Macdonald-Harrington Building.

A diverse team

"It conforms to surfaces because it is about 80 per cent filled with particulate. And when it rolls quickly, the particulate centrifuges, creating a void between it and the rim and allowing the wheel to dissipate energy when it hits rocks."

The disadvantage, though, is that it consumes about twice the energy of a rubber tire. "So on flat surfaces you won't go as far with the same energy," he says.

"But for travelling uphill, the wheel's rolling resistance is not as important as its ability to carry the vehicle's weight."

The lunar wheels project — a collaboration with the Ottawa-based Neptec Design Group and the Canadian Space Agency (CSA), along with funding by the Natural Sciences and Engineering Research Council of Canada (NSERC) — has involved a large, diverse team.

By Patrick McDonagh

"Undergraduates are very good at designing and building things," Professor Radziszewski says, "and graduate students are very good at analysis and simulations."

"We created a dynamic where, as part of their fourth-year capstone course, undergraduates design and build prototypes and test equipment, and then our graduate students use these to validate models and feed back into the design process."

So far, about 60 students have taken part, as well as Mechanical Engineering Professors Damiano Pasini, Vince Thomson and Larry Lessard, and Electrical and Computer Engineering Professor David Lowther.

With another year to go on the Neptec contract, about 20 more students will likely join the roll of iRing designers.

Professor Radziszewski says there is no guarantee that McGill's iRing wheel design will one day roll across the moonscape.

"Our goal is to identify the most appropriate wheel for the rover," he says, "and in doing that our team is evaluating various designs generated by students and the Neptec Design Group's other partners."

"But the iRing is certainly competitive and it's definitely new, so we have a real shot at it."

"What we have done, quite literally, is reinvent the wheel!"

OWEN EGAN

Professor Peter Radziszewski and master's student Daniel Oyama discuss the pros and cons of wheel mechanisms that could be applied to lunar vehicles.

McGill Engineering's 2011 Alma Mater Fund goal is $1-million. Thank you for your past and future support.

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514-398-1371 • engineering.alumni@mcgill.ca
817 Sherbrooke Street West, Montreal, Quebec, Canada H3A 2K6

Editor: Ken Whittingham | Principal Writer: Patrick McDonagh
Photography: Owen Egan | Design: Eliot Edwards, Studio Outlook