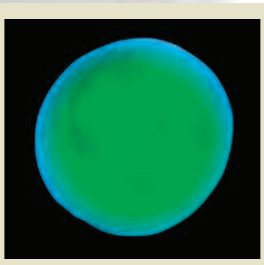
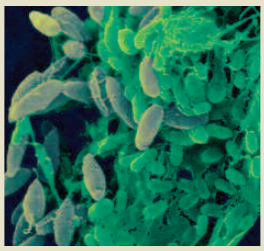
McGill in Focus
FALL/WINTER 2005

ENGINEERING
edition





Engineering for the Environment

THIS ISSUE

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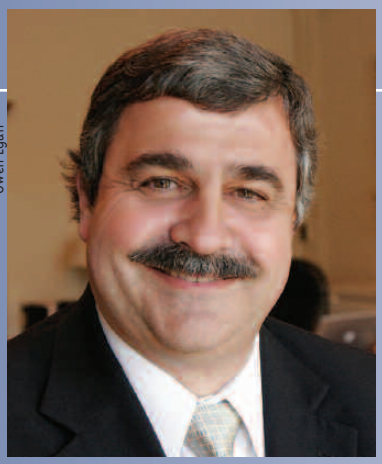
Front cover: Viviane Yargeau, Assistant Professor of Chemical Engineering (photo by Owen Egan); insets are (from the top) cryptosporidium, e.coli, and biofilm (by Dennis Kunkel Microscopy), all part of the research of Nathalie Tufenkji, Assistant Professor of Chemical Engineering (see page 5)



Owen Egan

Dean Christophe Pierre

Dear Graduates and Friends,

In my first months as the Dean of Engineering I have been impressed and touched by the warmth of the welcome I have experienced.

My first job on campus has been to learn my way around McGill; the Faculty of Engineering is a large enterprise with plenty to discover. What is evident, however, even at this early stage in my deanship, is the tremendous commitment from faculty, alumni, students, support staff and administration – a sign of a great, thriving institution with strong foundations.

McGill has a well-earned international reputation. The professors and technical staff are top-notch and the students are outstanding. The Faculty has an excellent, collegial research environment, with vibrant interdisciplinary activities across departments and with other Faculties, such as Science, Medicine, Dentistry and Management. But the world of engineering – in professional activity as well as university education and research – is changing rapidly, and we must work hard, not just to keep up with the pack, but to place ourselves at the leading edge.

So what can we expect from the future? Naturally, our engineering education will continue to cover the core areas. But we must also develop strategic interdisciplinary areas such as advanced materials, micro- and nanotechnology, biomedical engineering, and environmental design. This edition of *In Focus* describes new research in environmental engineering and design – just one area where society is relying upon us to drive technological innovation. Ensuring that we have the necessary resources to attract and retain outstanding faculty members and graduate students to McGill will be another priority. We must also continue to build collaborative relationships with local and international industry. More intensive recruitment activities in high schools and CEGEPs will help us to fortify our undergraduate student body, while community outreach strategies will raise awareness, among potential students and the general population, of just what it is we do in our disciplines and why our activities are important to a prosperous society. Our work is cut out for us, but we are in a very good starting position.

I had the pleasure of meeting some of you when I attended summer and fall events. I look forward to hearing from you over the coming months and to meeting more of you as I settle into my position as Dean.

Christophe Pierre

Alumni Profile: Andrew Benedek

In 1980, Andrew Benedek, BEng(Chem)'66, left his position as a professor at McMaster University in Hamilton to form Zenon Environmental Inc., a company that would develop and market a new approach to water treatment called membrane technologies. "Everybody in the world thought I was crazy," he says. Since then, however, the skeptics have come onside. Today, membranes are seen as a critical strategy for purifying water with microbial parasites not treatable by other means. And as the technology has advanced – in no small part thanks to Zenon's research and development effort – membrane technology has evolved from being a small, niche application to performing a broad range of services on a large scale. It has proven to be one of the most effective ways to purify drinking water, treat wastewater and produce high-quality process water for a range of applications. After a quarter of a century, Zenon Environmental, which Benedek still leads as Chairman and CEO, has 1,300 employees, offices in 14 countries and customers in more than 40. The company has seen annual growth of 20 to 30 percent, with the profits being reinvested in development, and is now recognized as a world leader in membrane technology.

Benedek, who received an honorary doctorate at the June 2005 Engineering Convocation ceremonies, traces his interest in water treatment to a 1964 summer job during his undergraduate studies at McGill. "Back in those days, they had no treatment at all," he recalls. "A brand new chemical plant, now defunct, on the South Shore of Montreal was putting out smelly compounds. People were complaining to the Quebec water board, so the company decided to hire a student from McGill to figure out the problem. To make sure they didn't succeed, they picked the most inept guy in the class, namely me. I might have failed to solve their problem, but I found my cause. I felt it was unfair to allow people to pollute like this, so I started reading up on pollution. Improving water quality became a life-long pursuit."

Andrew Benedek

In 1970 Benedek earned his PhD in Chemical Engineering from the University of Washington in Seattle. He then joined the faculty at McMaster, where he continued teaching and research in water treatment. During his 10 years at McMaster, he became convinced by the potential of membrane treatment – and by the benefits of developing the technology within the private sector. "I left McMaster to start my company and, once I resigned, I had no way of making a living but by succeeding," he says. "I kept making mistakes, but I recovered and learned the hard way how to create what is, today, a great business."

Benedek has won numerous honours, including the 2004 International Award from the Society for Chemical Industry, in recognition of his contribution to the industry in Canada and abroad, and a Queen's Golden Jubilee Medal, awarded in 2002 by the Government of Canada. From 2003 to 2004, he was one of the founding directors of the Board of the Clean Water Legacy Trust in Ontario. Zenon Environmental has also received its share of accolades, including the Stockholm Industry Water Award and Canadian online magazine *Corporate Knights'* top honour as Best Corporate Citizen in Canada in 2002 and 2004. One expression of the outstanding corporate citizenship for which the company is noted was the donation and delivery of water purification equipment to New Orleans in the aftermath of Hurricane Katrina.

In his speech to the graduating class of 2005, Benedek identified four rules for success. The first is motivation. "Find something you believe in and pursue it! Put your heart and soul into it, and over time, magic happens," he said. The second trait: honesty. "Be honest with everyone, especially yourself," he stressed. Then one must also be persistent in developing one's ideas. And finally, citing Jung and Goethe, he said, "You have to have faith in life." Benedek then exhorted the young graduates to "go out and make the world a better place" – a directive that has clearly guided his own activities and successes.

Engineering for the Environment

Going Green

When Jim Nicell received his doctorate from the University of Windsor in 1991, the CBC announced the news: his was Canada's first formal PhD in Environmental Engineering although, he notes, other people were already doing environmental engineering work. Today, in addition to serving as Associate Dean (Student Affairs) and professor of Civil Engineering, Nicell has been investigating the use of natural enzymes that catalyze reactions to treat waste material. He has also collaborated extensively with Chemical Engineering professor David Cooper to investigate the environmental fate of plasticizers, which give plastics their flexibility and workability. "About 200 million tons of plasticizers are created each year in North America, which ultimately go into the environment. Studies showed that these were non-toxic and eventually degraded," says Nicell. But, as has recently been shown, some of the most common plasticizers, while non-toxic, are endocrine disruptors – they trick the body into thinking they are hormones, thus affecting processes in the development of organisms, such as humans. Some would argue that natural degradation mechanisms should take care of this problem. Cooper and Nicell also found that plasticizers, when exposed to common soil organisms, break down into stable products that are much more toxic than the original precursors. "By continuously releasing these plasticizers into the environment, we could be adding one more element to the toxic soup that is influencing the health of organisms," says Nicell.

Owen Egan

Jim Nicell

Nicell and Cooper have just embarked on a new collaboration with Richard Leask, Milan Maric and Viviane Yargeau, all from Chemical Engineering. "We want to take the knowledge we have gained from studying plasticizers to create a 'green' plasticizer, which is easily produced and environmentally benign," says Nicell.

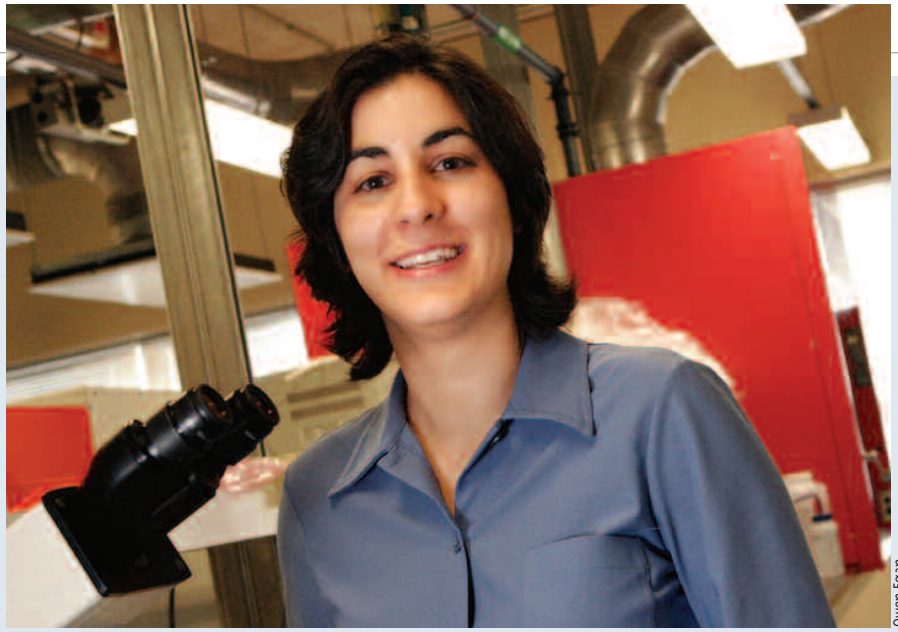
Image from project website at mcgill.ca/mchg

Edible Landscapes

When Architecture professor Vikram Bhatt looks at a city these days he sees unused farmland, with agricultural potential latent in roadsides, rooftops, trellises and suburban plots. As primary investigator on a research team that includes David Brown and Jeanne Wolfe from Urban Planning and John Henning from the McGill School of Environment, Bhatt is exploring ways to use spaces in the urban landscape to grow food for its residents. The project, called "Making the Edible Landscape," is funded by the International Development Research Centre and operates urban-agriculture research initiatives in three cities. The team is testing the project's potential in a new suburb in Kampala, Uganda, and in squatter communities in Colombo, Sri Lanka and Rosario, Argentina. "The prospect of integrating agriculture as a permanent urban feature forces you to take a different view of city environments," says Bhatt. "Why not make landscapes edible?" The project involves more than the planning of new garden neighbourhoods, however; it also examines housing designs conducive to supporting gardens and ways to upgrade squatter communities to provide permanent and sustainable housing while also improving agricultural opportunities.

Visit the Edible Landscape project web site at www.mcgill.ca/mchg/projects/edible/

Tracking and Treating Pathogens

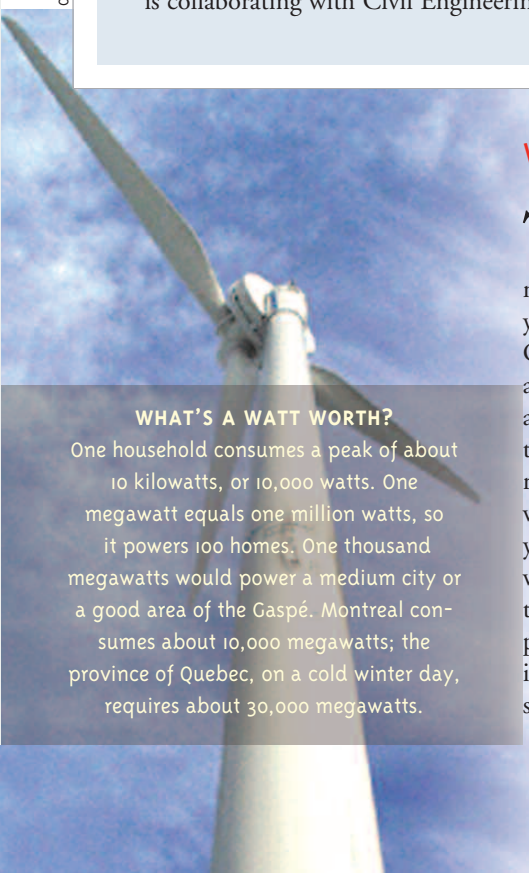


Owen Egan

Nathalie Tufenkji

In Walkerton in 2000, *E. coli* bacteria in the drinking water left seven dead and 2,000 sick; in Milwaukee in 1993, Cryptosporidium was linked to more than 100 deaths and made another 400,000 ill. Nathalie Tufenkji, BEng'99 (Chem), assistant professor in the Department of Chemical Engineering, who arrived at McGill in January 2005 and is now Brace Professor and the Canada Research Chair in Biocolloids and Surfaces, is using innovative techniques to study these pathogens at the micro and nano scales, as well as the more traditional lab scale. Her ultimate goal is to relate the information discovered in the lab and under the microscope to what happens in the field. "I'm trying to understand how these microbial pathogens get into the groundwater, where they go and how far they can go, so we can understand the potential for contamination," she says. "This research is relevant for water treatment plants, as the same processes are taking place there and in the natural subsurface environment. Basically, we are developing new models for predicting and controlling pathogen contamination." Tufenkji is collaborating with Civil Engineering's Subhasis Ghoshal, as well as professors from the Institute of Parasitology and the Faculty of Agricultural and Environmental Sciences, to investigate natural filtration and the spread of pathogens, often found in manure, in Quebec agricultural soils. "The techniques developed here can be applicable elsewhere," she notes. "Ground filtration research is also directly relevant to developing countries where potable water is a major concern."

Her other streams of research involve the relatively new areas of biofilm formation and nano-litter. "Biofilms are the sort of thing you get on your teeth in the morning," she says. "While you want to prevent them for biomedical implants, you may want to promote them in water treatment facilities, where biofilm formed on a filter provides an active layer of filtration. And nanotechnology is also big these days – but what are the consequences of nanoparticles in the environment? Can they get into our drinking water supply and if so, where would they go, how long would they stay and what are their impacts on microbial and more complex life forms? Very little has been done on this subject."



Ontario Hydro

WHAT'S A WATT WORTH?

One household consumes a peak of about 10 kilowatts, or 10,000 watts. One megawatt equals one million watts, so it powers 100 homes. One thousand megawatts would power a medium city or a good area of the Gaspé. Montreal consumes about 10,000 megawatts; the province of Quebec, on a cold winter day, requires about 30,000 megawatts.

Winds of Change

The turbines they are a-turnin'. Hydro Québec is building a new 1,000-megawatt wind farm in Gaspé to add to its 30,000 megawatts of traditional hydro resources, and plan to build more wind farms in the future. "But unlike other sources – water, coal or nuclear power, where you can control how much you produce – with wind you are at the mercy of nature," says Frank Galiana, who is a member of the Power Group in Electrical and Computer Engineering. Galiana and his Power Group colleagues, Boon-Tek Ooi and Geza Joos, are investigating the technical and economic issues involved in integrating wind power with the main electrical system. "Even though you put wind farms in optimum areas, you don't get the right winds all the time, so they run at about 30 percent of capacity, on average. The more you have random generation over which you have no control, the more difficult it is to keep up with demand," says Galiana. "And you have to follow demand in a matter of seconds to keep the integrity of the system – otherwise you have a blackout. So the random wind supply has to be compensated for by using traditional hydro generators." The Gaspé wind farm's production will provide about one and a half percent of Hydro Québec's overall energy supply, but the energy generated by wind – when it isn't actually needed by consumers – can also be used to save water in dams, thus helping to store energy for the future. "Wind power isn't insignificant," stresses Galiana. "And it's a start."

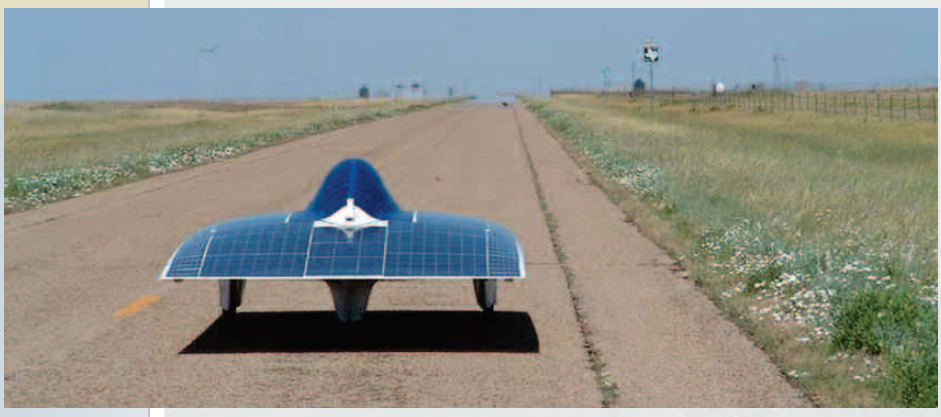
Check out the Power Engineering Research Lab web site at www.power.ece.mcgill.ca/

Healthy Rivers

Viviane Yargeau collecting samples

Canadian waterways contain close to 80 different bioactive pharmaceutical compounds, according to samples taken across the country. "They are in low concentrations, but they still have an effect and they shouldn't be there," says Viviane Yargeau, assistant professor of Chemical Engineering, whose research focuses on developing more effective ways to degrade pharmaceuticals in waste waters. Recently Yargeau has been taking samples from the Yamaska River in southern Quebec, testing for 14 pharmaceutical compounds that have turned up in Ontario and the United States, and she is working with colleagues at Trent University to develop analytical techniques that would detect very low concentrations. "This research on pharmaceuticals degradation must be collaborative," she notes. "You need to pull together a wide range of expertise to do it efficiently." Different problems arise when moving from the laboratory to the industrial scale. "We may know it is possible to degrade a pharmaceutical through lab testing, but it is a completely different engineering problem to scale up the process," she says. "You have to be very precise and perform your tests with the appropriate type of water for the area whose wastewater you want to treat – or it won't work in the field."

Treatment can be biological, using micro-organisms – or chemical, including processes like ozonation – or a combination of the two. "If biological treatment isn't enough to break down the pharmaceutical waste, chemical treatment could be included as a step added before or after the biological treatment. It would also be good to carry out the treatment at one of the sources of contamination, such as the effluent of hospitals or of pharmaceutical industries, where concentrations of pollutants would be higher," she explains. "We aim at developing a treatment which could not only degrade the compound but degrade it into something non-toxic."



McGill's "iSun" solar car

Fire

Energy research has come a long way since humans first discovered fire and combustible fuels – but the quest for alternate sources of power continues more vigorously than ever. Geza Joos, a member of the Power Group in Electrical and Computer Engineering, researches new battery technologies for energy storage. In Mechanical Engineering, Peter Radziszewski leads students in creating electrical and hybrid electrical vehicles. Their projects have attracted some high-profile attention: this past year, the electric snowmobile developed by his students was tested for a zero-emissions American scientific research base in Greenland. "The students do these projects to gain knowledge, but they are addressing real-world issues," says Radziszewski. In Chemical Engineering, Sasha Omanovic investigates advanced nanostructured electrocatalysis for generating hydrogen fuel, and Corey Leclerc studies ways of engineering reactors using alternate fuels. Phil Servio explores what he calls the "enormous energy potential" of gas hydrates, a possible alternative source of fuel such as methane, one of the cleanest fuels.

Water


Owen Egan

Van-Thanh-Van Nguyen

Canada has water in the bank and its value is rising daily. But this liquid asset will demand increasingly sophisticated levels of management if it is to remain plentiful, accessible and clean. Van-Thanh-Van Nguyen, a professor in Civil Engineering, explores issues in hydrology and water resource management, modelling and simulating how communities manage their water supplies. Nguyen is particularly aware of the relevance of these issues to our understanding of problems related to global warming – he is also Associate Director of McGill's Global Environmental and Climate Change Centre. Susan Gaskin, the Brace Associate Professor in Civil Engineering, specializes in environmental hydraulics, from analyzing hydrological problems using laser-induced fluorescence technology and particle image velocity to looking at ways to restore damaged habitats; she has also served as an important mentor to McGill's student chapter of Engineers Without Borders. Ronald Gehr, editor of the *Water Quality Research Journal of Canada* and Director of the Environmental Engineering Lab in Civil Engineering, is also Chair of the Master of Environmental Engineering Committee. He studies and teaches wastewater treatment analysis and processes as well as aquatic chemistry, in addition to developing a wide range of learning resources for environmental engineering students. Dimitrios Berk, Chair of Chemical Engineering, has worked with the pulp and paper industry to develop processes that produce a clean effluent and is currently investigating chemical processes that could be used in wastewater treatment. "Our job is to design processes that are environmentally friendly," he says. "We used to try to find ways to clean up waste, and that is still necessary – but we also want to avoid producing waste."

Clearing the Air

In 2002 and 2003, India's capital city, New Delhi, converted its entire public vehicle fleet – buses, taxis and for-hire motorized three-wheeled vehicles – to compressed natural gas (CNG), in response to rapidly deteriorating air quality. The city now has around 80,000 CNG vehicles on the road. Madhav Badami, who is cross-appointed between the School of Urban Planning and the McGill School of Environment, is leading a collaborative research project, funded by the Social Sciences and Humanities Research Council, to investigate the cost-effectiveness of New Delhi's dramatic switch to CNG. His research team will measure the value of reducing emissions of conventional air pollutants and greenhouse gases against the considerable investment in a new fuel infrastructure. "Although this switch was a significant achievement, we want to understand the system-wide socio-economic and environmental impacts, the decision-making processes involved, and how we can develop and implement more effective policies with regard to alternative fuels in India," he says. "Also, Delhi's experience with CNG offers an unprecedented opportunity for assessing the long-term viability of alternative fuels in rapidly motorizing low-income countries."


Owen Egan

Madhav Badami

Badami, who first trained as a mechanical engineer and worked nine years in the Indian truck and bus industry, teaches and conducts research in environmental policy and planning, focusing on transport-energy-environment interactions and alternative transport fuels. He brings this research into the classroom, too. The final-year studio course in Urban Planning regularly involves student teams working on real-life environmental policy and other problems for real-life clients. "Last year, a student group carried out a project for Montreal's transit authority, developing a policy-analytic framework to select alternative fuels for their bus fleet," he says.

This year, Badami is Chair of the Environmental Engineering Committee, whose mandate is to promote teaching and research focused on the environment within the Faculty of Engineering. Badami's colleagues on the committee are Julia Bourke (Architecture) Ronald Gehr (Civil), Ralph Harris (MMM), Geza Joos (ECE), Siva Nadarajah (Mechanical), Nathalie Tufenkji (Chemical), Robert Bonnell (Agricultural and Biosystems Engineering) and Garry Peterson (McGill School of Environment).

Professor Tim Lee with wind tunnel

Bruce Field

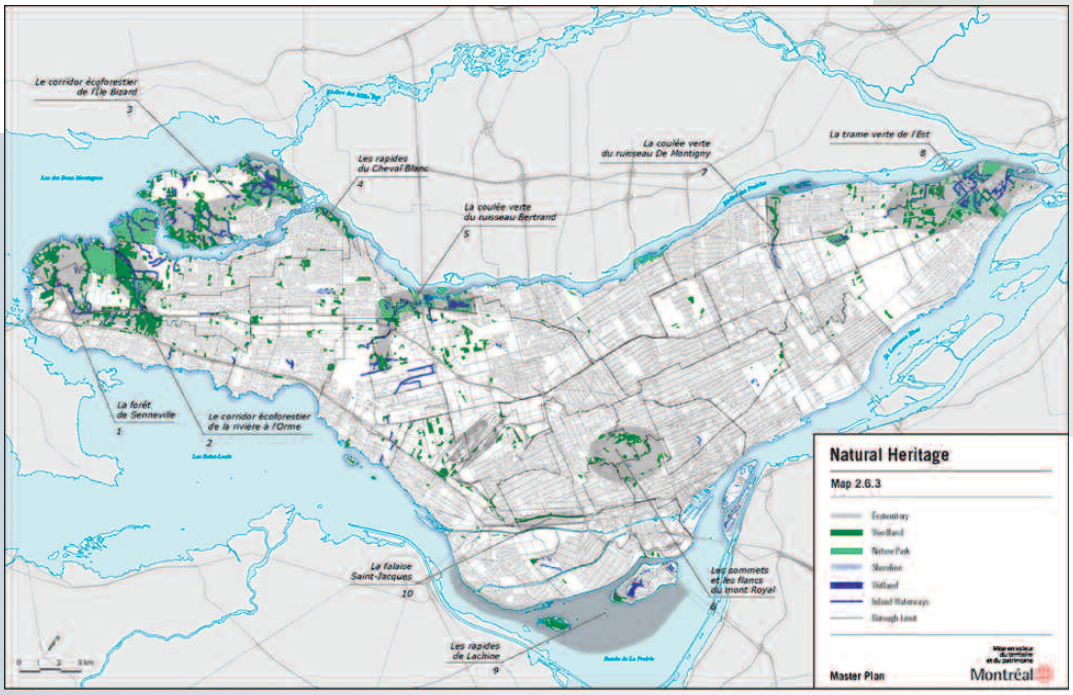
Earth

McGill professors are investigating ways to reduce the weight of the footprint of industry, hoping to reduce damage to the terrestrial environment. Chemical Engineering professor David Cooper is an expert on the bioremediation of waste in soils and water, in particular the interaction between plasticizers and micro-organisms. He has worked on a series of ground-breaking projects with Jim Nicell from Civil Engineering. Another Civil Engineering professor, Subhasis Ghoshal, has established an international reputation in the remediation of contaminated soils and groundwater, and has created new ways to track organic compounds as they travel through subsurface soils. His future projects include a collaboration with Chemical Engineering colleague Nathalie Tufenkji. Their work could have important consequences for water purification processes in Quebec and in developing regions in other parts of the world. Ghoshal also works with the McGill School of Environment, developing courses in global issues and natural resource use at the Bellairs Institute in Barbados.

Professor David Brown, Director of the School of Urban Planning, researches deals with environmental governance and the progress made by individuals, small groups, institutions, experts, municipalities and larger political units in managing the environment. From January to April 2006, he will be working in Managua, Nicaragua, looking into the influence of individuals and small groups on environmentally significant decisions and studying the horizontal relations between municipalities. In Montreal, before some suburban municipalities were merged under a central government, many municipalities had borders running through forests or down the middle of streams, creating tremendous complications for environmental planning. Montreal's new urban plan includes the concept of eco-territories, such as the Senneville forest, Mont Royal, and the Cheval Blanc Rapids. "Modern urban planning began at the start of the 20th century in response to problems with environmental pollution and has always sought the right balance between social, economic and environmental issues," says Brown, who has been involved in developing Montreal's eco-territories plan. "Environmental concerns permeate everything we do."

Air

Airborne pollutants are now so common that urban weather reports are supplemented with air-quality indices. But – take a deep breath – Murtaza Haider (Urban Planning/Civil Engineering) is developing a lab that could model greenhouse gas emissions in urban areas in a variety of scenarios. For instance, if a new bridge were to link Laval and Montreal, how would it influence traffic patterns, the number of cars on the road and greenhouse gas emissions over Montreal? Haider is not alone in the field; other professors working to ensure air quality include Chemical Engineering's Richard Munz, who has explored the application of thermal plasma technology in the destruction of toxic particulate matter, and Janusz Kozinksi, from the Department of Mining, Metals and Materials Engineering, who has researched greenhouse gas mitigation. Of course, clean air can be used in the service of engineering efficiency. Mechanical Engineering's Aeronautics Laboratory wind tunnel enables researchers to develop more efficient aircraft, saving on fuel and reducing both greenhouse emissions and noise pollution.



Eco-territories from Montreal's new Urban Master Plan

Risk Assessments: Roussos Dimitrakopoulos

Owen Egan

Developing and operating a mine is a risky business; according to an oft-cited 1990 survey, 73 percent of North American mines fail. "So you need to organize a mining operation's production to respond to demand for metals, while still accounting for the inherent uncertainties involved with the business," says Mining, Metals and Materials Engineering professor Roussos Dimitrakopoulos. "It's easy to say, but not so easy to do." Dimitrakopoulos, who came to McGill this May from the University of Queensland in Australia, is working on the creation of complex stochastic models that try to incorporate uncertainty into mining operations to give a more robust assessment of possibilities and outcomes. "Stochastic models and optimization can be used to assess the content of metal in ore and then to plan the sequence of operations." Sequencing means time-value planning: for instance, if lower-grade ore is mined at the beginning of the process, initial income will be lower at the start. If mine operators want to get the most out of the enterprise, they must determine which sequence will maximize their profit. "Now we have a better idea of the whole animal and the frameworks and techniques we need to work with," says Dimitrakopoulos. "We've done the initial work of developing technologies; we've tested results to see how they work in reality; and we are continuing to go back and forth to refine our models and develop new ones." Because these strategies enable companies to sequence the mining and removal of waste, along with the ore, they could also have important environmental benefits. "It's complicated, but you could determine how to blend waste to promote certain types of vegetation growth," says Dimitrakopoulos. After an industry slump in the 1990s, business is booming and there is a shortage of qualified mining engineers. "Mining is a high-tech industry, and involves computer modelling. And you get to travel all over the planet, so it is an exciting job, and an area that we need to develop further."

On June 10, the Faculty announced that it will be receiving $800,000 in research funding from the Australian mining company BHP Billiton. McGill won the funds in competition with Queen's, the University of Toronto and UBC, after the mining program director, Ferri Hassani, and Mining, Metals and Materials Chair Robin Drew, with the support of the Dean's office, put together a package that leveraged $3.5 million in funding from the Canada Research Chair and Canada Foundation for Innovation. "By having an excellent and world-renowned Mining Engineering program and a winning proposal, McGill was able to win this competition," says Ferri Hassani. The funds enabled McGill to invite Roussos Dimitrakopoulos to join the Faculty as holder of the Canada Research Chair in Sustainable Mineral Resource Development and Optimization Under Uncertainty.

Owen Egan

(l to r) Brian Baird, BHP Global Practice Leader – Mine Planning; Roussos Dimitrakopoulos; Ferri Hassani; Mike Eamon, BHP Global Practice Leader Hydrometallurgy/Technology; and Robin Drew.

Meet the New Dean

Dean of Engineering Christophe Pierre with former Dean John Gruzleski

Owen Egan

Christophe Pierre set himself a big job this summer: getting to know McGill and the Faculty of Engineering, and then preparing to build on the successes of John Gruzleski's tenure as Dean to ensure that the Faculty grows and thrives in an increasingly competitive international environment. Pierre came to McGill from the University of Michigan on July 1 to assume his duties as the new Dean of Engineering.

Originally from France, Pierre joined the faculty at Michigan in 1985, where he established himself as a top teacher, researcher and administrator. An expert in vibrations and structural dynamics, Pierre is affiliated with McGill's Mechanical Engineering department. His work involves modelling structures – automotive, aircraft or satellite structures, for instance – analyzing and predicting their vibratory responses under different loads, and finding ways to alter structures to minimize vibration. "If something vibrates too long, it develops cracks, fatigues and fails. And you really don't want that to happen on a jet engine's turbine blades," he says. This research has attracted industry collaborators, such as Pratt & Whitney and General Electric.

While Pierre plans to continue his research activities at McGill, however, his priority will be to guide the Faculty to greater successes during a time when engineering is a fast-evolving discipline. "McGill has a very strong foundation, and we will be building on that. But there are tremendous changes happening in engineering, so there's no question of staying where we are – and following the pack is not good enough. We should be leading," he says. Some of these changes lie in the growth of new research areas. "Some new fields may vanish, but others – like biomedical engineering – are here to stay. We have a tremendous opportunity to lead in medical design methods, a field which will have an enormous impact," he stresses. "Environmental design will also influence many aspects of engineering, in terms of everything from new energy sources to water resource management to remediation of contaminated properties and industrial sites." Such cutting-edge interdisciplinary work also demands more top-notch graduate students. "I don't think the professors at MIT are any better than ours, but they get the very best graduate students in the world," says Pierre. The challenges to recruiting top professors also apply to graduate students: the University is competing with institutions that can offer substantial financial packages. The Faculty's task is to develop its own package – partly financial, but with other incentives as well – that will coax these students to McGill.

Undergraduate education is also experiencing some subtle changes. "An engineering education provides very attractive problem-solving and analytical thinking skills," says Pierre. "Our curriculum must be based on core disciplines, but increasingly students are using undergraduate engineering degrees as a solid base for other professional programs. Thus, we must ensure that their undergraduate education extends to areas like ethics, teamwork, and communication." But despite the degree's versatility and usefulness, institutions across the continent are finding that levels of interest in engineering and science careers are waning among university applicants, in comparison to that shown for fields such as medicine. "We have to market our work and get young people excited about engineering careers," Pierre points out. "We need outreach programs that inform people about engineering, and the careers open to people with engineering degrees."

All of this will require new resources, of course. "I've been impressed by how people at McGill have made the best use of the available resources," says Pierre, "but we are at a disadvantage when competing internationally." Most of McGill's research dollars come from the federal and provincial governments; the Faculty has developed some industry support, but the future must see increased collaborations with both local and international industry. "Our goal is to be one of the top engineering universities in the world," says Pierre. "We have a strong foundation, and we're doing well. But we must keep doing more."

Front of the Class

Each year l'Ordre des ingénieurs du Québec awards four bursaries to university students who excel academically while remaining engaged in community activities.This year, McGill students took two of the awards: Yunlu Shen, in her final year of Civil Engineering, won the gold medal and the $7,500 prize that accompanies it, while Paul Hébert, who will graduate from Mechanical Engineering this year, won the $1,500 third prize. In a short essay on the responsibilities of professional engineers, Shen argued that "engineers are not only responsible toward their employers and clients – their paramount professional duty is to protect the public's health and safety." Among other things, Shen, who is the VP Academic of the EUS, organized a conference on engineering for female high school students, and is an avid painter and pianist. Hébert has worked extensively in the Big Brother program and has also volunteered at St. Mary's and the Jewish General Hospitals, in addition to working with McGill groups like Engineers Without Borders.

Owen Egan

Paul Hébert and Yunlu Shen

Starting their Engines

Hot wheels were never this good. Two of this past spring's graduates have joined the Ferrari team, working in Maranello, Italy, as part of the five-member Innovation Team Project. Gaurav Gupta and Paolo Gatto were selected from many international candidates as winners of one year scholarships worth one-year scholarship worth 25,000 Euros – and including accommodation, professional mentoring and classes in Italian. Ferrari selected the international team of recent graduates as a way of generating fresh ideas for applying state-of-the-art technology to its GT line of cars. Gatto, a computer engineer, and Gupta, a chemical engineer, are part of the multidisciplinary group working on the Human Machine Interface. If the project goes well, it could lead to full-time employment with Ferrari for the two graduates.

Jack Goldsmith

Jack Goldsmith

Paolo Gatto and Gaurav Gupta

The Engineering Business Speaker Series, which invites leaders from the local business community to meet with the Faculty's students, has a new sponsor: CMC Electronics. CMC is already an important partner in the Master in Manufacturing Management Program and is one of several companies offering this program's students tours of plants and opportunities to undertake case studies in an industrial setting. Last spring, some of the Faculty's professors met with representatives of CMC Electronics.

(left to right): Angelo Segall, Director, Engineering Support, CMC Electronics and adjunct professor in the Master's in Manufacturing Management program; Patrick Champagne, Vice-President, Engineering and Continuous Improvement; Jean-Pierre Mortreux, President and CEO; former Dean of Engineering John Gruzleski; and ECE Professor Frank Ferrie.

Owen Egan

Alex Conliffe (left) with interview subjects in the Taleghan region, 120 km northwest of Tehran (Inset) Traditional water harvesting in Iran, using a pond to collect rainwater running down a slope

Rhodes Scholar in the Field: Alex Conliffe

This summer, Rhodes Scholar Alexandra Conliffe, BEng(Mech)'04, worked on her Oxford master's thesis, "Watershed Management in Iran: An Investigation Using the Sustainable Livelihoods Framework," which took her into the field for research. "The only thing that I could anticipate was that things wouldn't go as anticipated," she says. As the first foreign female to work in the Watershed Management Department of the Ministry of Jihad and Agriculture (MoJA), she writes that there was "some angst" regarding her visit. Over the summer, she kept in touch with friends via her email diaries.

June 12, 2005

Have had a whirlwind few days – on day one I was up at 5 a.m. and off to Hashtgerd where I will be doing most of my work, and the same on day two – over 24 hours in the field! I was exhausted. I came back to Tehran, where I am living in a guesthouse room in the MoJA compound. I have a nice big room and food shows up at the door at unexpected times, sending me flapping around for my manteau and veil so that I am appropriately dressed to answer the door.

June 15, 2005

Many of you have asked what exactly it is that I am doing here so I thought I'd fill you in. Essentially, I'm looking at integrated water management here in Iran, and specifically in two catchment areas in Tehran province. For a few thousand years, Iranians have overcome [water management] challenges using traditional methods and water-sharing systems. However, population growth, introduction of pump-wells, a desire to "modernize" agriculture, food security and land reforms have changed everything – traditional methods can no longer meet water demand and have been abandoned in favour of unsustainable methods – even where traditional ones might still serve a purpose.

June 22, 2005

My research has seen some ups and downs this week. I have been working at the national MoJA office in Tehran and here the concept of integrated watershed management is quite a priority. Because I've been told that there is a lack of quantitative data, I decided to focus on the qualitative stuff and really seek out what people think about watershed management, if they think it is improving their lives and if they feel that they have a voice in the decision-making process. What I didn't realize is that these ideas are totally foreign at the local MoJA office in Hashtgerd so when I went yesterday I suddenly found myself surrounded by eight "Jihad-and-Agri" men saying "what's the point of your research?" "there is no methodology behind this" "you need quantitative data" "who cares what people think?" It was at this point that I realized that I was surrounded by eight engineers. They are a really frustrating group of people sometimes! Anyway, luckily the boss was on my side and said that if we only look at the physical side then we won't make progress, and that my work was important. Some of them were willing to think about it, others decidedly not, but everyone agreed that they should let me give it a try, and that they would wait to see how I succeed. No pressure.

July 4, 2005

We started doing interviews this week. We have conducted interviews in people's homes, in mosques, in a hardware store, even in the back of the truck while driving from one village to the next. It's amazing how tea can suddenly spring from the strangest places along with fresh cucumbers, sour cherries and apricots.

Thinking of you all, as always.

Alex, xoxo

Fire up the birthday candles!

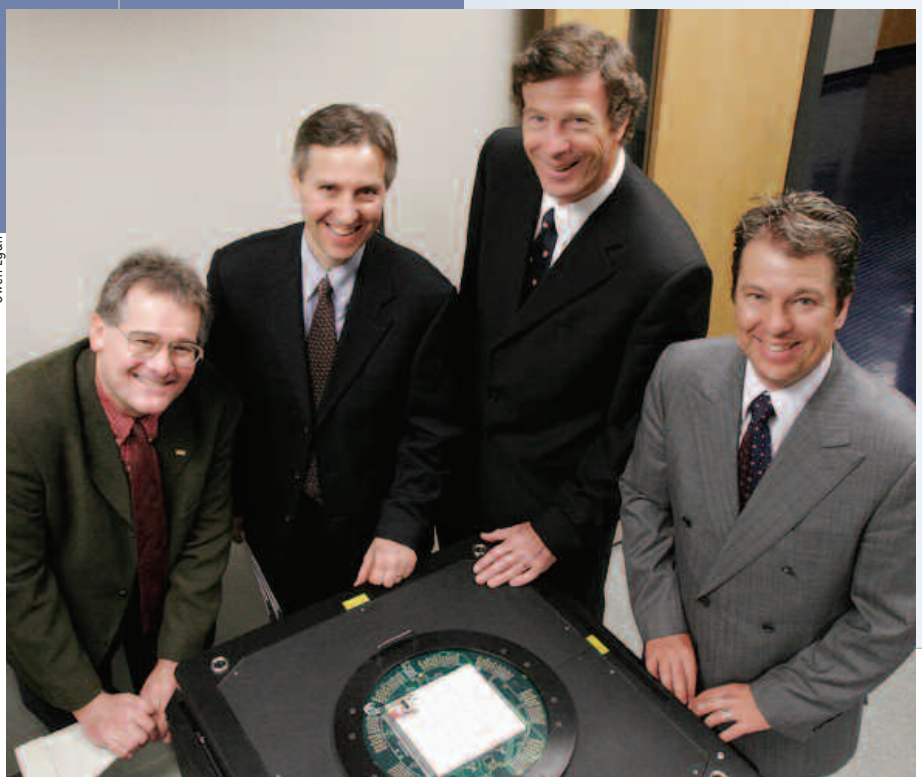
The Centre for Intelligent Machines (CIM) was born 20 years ago when ECE professors Martin Levine, Steve Zucker, Pierre Belanger, Peter Caines and George Zames came together to study intelligent systems. They invited researchers from Computer Science and from Mechanical, Biomedical, and Mining, Metals and Materials Engineering to join them. Today, CIM is internationally recognized for its research into a wide range of topics, including robotic vision, haptic interfaces and ambulatory robotics, to name a few. Nineteen professors are listed as official members of CIM, although others collaborate on CIM projects. In addition, numerous graduate students and technical staff bring their energy and intellects to CIM's mission: advancing knowledge in areas such as robotics, artificial intelligence, automation and speech recognition.

Nicolas Morin

(l to r) Lucie Paquet (Gluskin Sheff Travelling Scholarship recipient), Lena Buchinger (GSTS), Gerald Sheff, Sophie Bouchard (GSTS), David Covo, BScArch'71, BArch'74 (Director of the School of Architecture), Anne-Marie Bouchard-Bouliane (GSTS), Jean-François Champoux-Lemay (GSTS), Michal Gorczyca (GSTS), Principal Heather Munroe-Blum, Lawrence Siu (GSTS)

Building the Best

The School of Architecture's students will be treated to instruction by some of the world's most renowned architects, thanks to a million-dollar endowment by Gerald Sheff, BArch'64, to create The Gerald Sheff Visiting Professorship in Architecture. "The legacies of the world's great architects stand among the most powerful connections to our past and to the ways in which other generations lived, worked and thought," Sheff says. "I'm pleased to have an opportunity to support the learning of current and future architects, to provide opportunities for them to bring their vision to the public, private and commercial spaces that reflect our lives and times." The Professorship, announced this October, will bring some very high-profile figures to the School. "The program will attract the top minds in the field who, in turn, will seed the School with new ideas," he says. "As an undergrad, I had a teacher named Gordon Weber. He challenged us and made everyone see the world in a new light. My hope is that this endowment will give other students that same experience." Sheff is the Chairman and CEO of Gluskin Sheff and Associates, the investment management firm he established in 1984. The firm has also supported Architecture students through the Gluskin Sheff Travelling Scholarships, which enable top undergraduates to study abroad.



Owen Egan

High-Tech Benevolence

In May, members of the Faculty of Engineering met with representatives of IBM Canada at the Lorne M. Trottier Building to thank them for their support and identify new opportunities for collaboration. IBM Canada has donated over one million dollars in high-tech equipment to the Faculty.

(left to right)
ECE Professor Gordon Roberts;
Raymond Leduc, Director, Bromont Plant;
David Lowther, Chair of Electrical and Computer Engineering;
and Mario Cantin, IBM Senior Director, Higher Education and Research, with one of IBM's generous donations.

Owen Egan

The GM-NSERC Industrial Research Chair in Automotive Light Metals and Advanced Magnesium Alloys, held by Mihriban Pekguleryuz, is supporting research into magnesium alloys for the automotive industry

Homecoming 2006 – Reunions for class years ending in 1 and 6

October 19-22, 2006

All alumni are welcome to join in the festivities at Homecoming. If you are a member of a class celebrating an anniversary in 2006 that falls in the range from 5th to 85th, save the date now for your next reunion weekend! If you would like to help organize activities for your class, please contact Robyn Ouimet to join (or start) the planning team for your year. Tel: (514) 398-7138 Email: robyn.ouimet@McGill.ca.

Plan to kick off your Homecoming weekend on Friday, October 20, 2006, with the Engineering Dean's Breakfast, followed by guided tours of the Departments and Schools. Complete Homecoming brochures and registration packages will be mailed to you in the summer of 2006. View the tentative schedule online at www.mcgill.ca/homecoming, or get in touch with Robyn to find out more.

Engineering Class of 1955 Launches a new Class Gift

At Homecoming 2005, the Engineering Class of 1955 turned out in great numbers to celebrate their 50th anniversary. Inspired by rekindled friendships, they consulted the Dean about current priorities that could benefit from alumni support. Their legacy will be to fund the renovation of a seminar/multi-purpose room in the Macdonald Engineering Building, which will be renamed the Engineering Class of 1955 Seminar Room. For more information, contact Tom Rogers, BEng'55, at tomrogers@sympatico.ca or (514) 733-8527, or Robyn Ouimet in the Engineering Development Office at robyn.ouimet@mcgill.ca or (514) 398-7138.

FACULTY SUCCESS STORIES

Ken Fraser (ECE) was named an IEEE Life Member, and Dennis Giannacopoulos and Anas Hamoui shared the ECE Professor of the Year Award, from the Electrical and Computer Engineering Student Society. Steve Yue (MMM) has been awarded a Fellowship of the American Society for Materials, a tribute to his contributions both to ASM and the discipline. Jim Finch (MMM) was awarded MetSoc's silver medal, in recognition of his leadership and contribution to the development and maintenance of the Society. And Materials Engineering student Duc Trinh was the 2005 winner of the DAR Kay Memorial Iron and Steel Section Award, for demonstrating outstanding leadership as a student and in the wider community while an undergraduate in the Materials Engineering co-op program.

ENGINEERING SUPPORT

You can help support Engineering students directly. When you receive your pledge card through our Alma Mater Fund appeal, just check the box marked Faculty or School and write "Engineering" or the name of your Department or School in the space provided.

Make Your Donation Online!
You can make your gift on-line at www.alumni.mcgill.ca/online-giving/. Don't forget to select the Faculty of Engineering or specify your Department or School as your preferred area of support.

Endowments: Enduring Financial Security and Success

For longer than most Canadian universities have been in existence, McGill's administrators have guided our institution's financial affairs. For proof of their astute management, we need only look to McGill's general endowment, valued at roughly $800,000,000.

This is by no means a great pot of money that can be spent for the next project that comes along. In reality, the general endowment is made up of hundreds of smaller funds, with dedicated purposes, that have been pooled together to be more effectively managed by the Treasurer of the University, John Limeburner, and the Investment Committee of the Board of Governors. Many of the smaller dedicated funds that comprise the University's general endowment are for the Faculty of Engineering. Some, like the one that supports the William Scott Chair in Civil Engineering, are quite old, having been established at the turn of the last century. Others have been created since the last issue of Engineering *In Focus*.

How does a planned gift work? Is there any financial benefit to the donor who makes one?

A planned gift is a charitable donation arranged during a donor's lifetime but not available to McGill until sometime in the future. The most common type of planned gift is a bequest, but it is just one of many types.

A bequest to McGill University may serve to reduce, by means of a tax credit, the income tax payable by the donor's estate. A planned gift may eliminate or reduce tax on capital gains when appreciated property is given.

For More Information

McGill University, Bequests and Planned Gifts,
1430 Peel Street, Montreal, Quebec, Canada
H3A 3T3

plannedgifts.dev@mcgill.ca
tel.: (514) 398-3560 • fax: (514) 398-8012
1-800-567-5175

www.mcgill.ca/alumni-planned

McGill

New Endowments in Engineering

■ The Gerald Sheff Visiting Professorship in Architecture (see page 13) was established with a one-million dollar donation from 1964 Architecture graduate Gerry Sheff, of Toronto. The endowment will fund a new visiting faculty position focused on stimulating innovation and professional excellence through teaching, public speaking and research.

■ Through thoughtful planning of his estate, Charles Payan, BEng(Chem)'37, established a fund through a bequest that will now provide Dean Christophe Pierre with money to purchase much-needed equipment for teaching and research laboratories.

■ Robert G.H. Lee, BEng'47, DSc'98, from Calgary, and Gerald Heffernan, who lives in Toronto, have teamed up to create the Maude Toye Lee BEng'50 Scholarship in Chemical Engineering, in honour of the 55th anniversary of Maude's graduation from McGill.

■ The endowment established by the family of Ralph M. Collins and Ruth Gilmour Collins will finance a scholarship in their memory for undergraduates in Engineering.

■ The Peter Silvester Faculty Research Award in Electrical and Computer Engineering was created in honour of the late Electrical Engineering professor, with a donation from a graduate who studied in the Department. The award provides support for research-ers in the Department of Electrical and Computer Engineering.

By directing their donations and estate plans to create endowments with special purposes that will grow over time, generous alumni and friends are helping to secure the future of Engineering by strengthening its financial position. At the same time, donors can choose precisely where their funds will help most; they could be to purchase much-needed equipment, to support research and teaching, or to help recruit the very best student scholars to continue their education at McGill. But no matter what the purpose, the endowments of Engineering and McGill are built to endure.

For more information about the areas of greatest need within Engineering, please contact the Office of Development and Alumni Relations by telephone at (514) 398-1371, or email engineering.alumni@mcgill.ca

For more information about bequests and other planned gifts, please contact:
Bequests and Planned Gifts Office, McGill University
Tel.: (514) 398-3560 or 1-800-567-5175
or plannedgifts.dev@mcgill.ca.

Memorable Moments

Photos: Nicolas Morin

Photos: Catherine Farquharson

(Counterclockwise from above)

Emeritus Professor Tom Pavlasek proposes a toast at the McGill Alumni Association (MAA) dinner in Montreal on May 19.

The Class of '44 table at the MAA dinner
Back row (L-R): Mark Greenberg, Beverley Mendel, Tom Pavlasek, Joe Josephson, Muriel Groome, George Groome.
Front row (L-R): Art Mendel, Wendy Mendel-Greenberg, Lois Pavlasek, Rex Ford

Civil Engineering at the MAA
Back row (L-R): Shirley Sobol-Martoni, Ciro Martoni, Gisèle Lee, Michel Lee, Robyn Ouimet, Ingrid Saint-Cyr
Front row: Mallory Vincent, Richard Vincent, Michel Saint-Cyr, Prof. Denis Mitchell

At the Montreal Leacock Luncheon, September 30
Dean Christophe Pierre, Lorne Trottier, Arthur Lau, Terry Tobin, Engineering Development Office, Professor Peter Radziszewski, Mechanical Engineering, Robert G.H. Lee, Maude Lee

Leacock Lunchers:
Billy Denman, Maria Mastorakos, Gerry Dunkelman, Amanda Drew, Dean Christophe Pierre, Professor David Lowther, Chair, Electrical and Computer Engineering, Robyn Ouimet, Engineering Development Office, Professor Lawrence Chen, Dr. Alice Chan-Yip