Un seul autobus fait le travail de 50 voitures en émettant le quart des gaz d’échappement. Pas mal. Mais nous pouvons faire mieux. 

En matière de listes d’attente et d’hospitalisation, plus c’est court, mieux c’est. Voyez comment les chercheurs de McGill s’emploient à optimiser la gestion des soins de santé. …

Son territoire couvre la moitié de la province et sa population regroupe un demi pour cent des Québécois – et il pourrait représenter l’avenir de la province. Si vous n’avez pas déjà en tête le Nord québécois, vous devriez. (Nous l’avons.)…

Si la grandeur artistique ne s’enseigne pas, ne le dites pas aux membres du Département de langue et littérature françaises de McGill. Ils ne vous croiraient pas. …

McGill is proud to be a driver of innovation, of health and well-being, of economic prosperity, and of change—in Quebec, for Quebeckers.
McGill and Quebec

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uebec’s distinctive charms are justly celebrated. But a place this special can’t help but hold unique challenges. Our abundance of natural beauty brings with it an obligation to responsibly steward our land and its resources. This is no small feat; Quebec is Canada’s largest province by area, stretching from the southern Canada-U.S. border well into the sub-Arctic. Our passionate commitment to a strong social support system means careful planning is needed to help our large, greying Baby Boomer population transition out of the workforce and into a healthy retirement. Then, too, there are the challenges we share with the entire world, as we search for sustainable solutions to creating the energy that we need—and the pollution we don’t—and push forward in the international race to build prosperity and maintain a high quality of life.

Our Roots, Our Community: McGill and Quebec looks at how McGill University is responding to the challenges of today’s Quebec. This kind of problem-solving is very much in our DNA. For our founder, James McGill (1744–1813), community engagement wasn’t an abstract idea. It was a way of life, something the Scottish immigrant worked hard to put into practice in his adopted home of Quebec. Whether he was taking part in the large political machine as an elected member of the Legislative Assembly of Lower Canada, or spearheading smaller—but no less important—grassroots projects, such as creating a volunteer fire brigade, James McGill lived a life that wasn’t just in Quebec; but of Quebec.

James McGill was a Quebecer helping Quebecers, and so too are the people of the university that bears his name. The students, faculty and staff of McGill University continue our founder’s engagement with our communities, be they a short walk’s distance, or on the other side of the province. McGill is proud to be a driver of innovation, of health and well-being, of economic prosperity, and of change—in Quebec, for Quebecers.

And, above all, McGill is proud to be a Quebec university. While by no means comprehensive, we hope that Our Roots, Our Community gives you a sense of the breadth and depth of the ways the people of McGill are working to build health and prosperity at home.

Heather Munroe-Blum
Principal and Vice-Chancellor
McGill University

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20 McGill by the numbers
When Tanja Taivassalo, an associate professor in McGill’s Department of Kinesiology and Physical Education, happened to see 91-year-old Olga Kotelko set eight world records at the 2009 World Masters Championships track and field competition in Finland, she knew she had to get the nonagenarian powerhouse into her lab at the Montreal Chest Institute.

The Amazing Olga

“There’s no question Olga is remarkable,” says Taivassalo. “What we’re trying to understand is whether it’s her genes or how she’s been training that makes her remarkable. Was she born or was she made?”

Olga Kotelko has visited McGill twice, most recently in October 2012, when she led a five-kilometre group run to the top of Mount-Royal. Researchers tested her aerobic capacity while she exercised and found that, although her ability to take in and consume oxygen was what one might predict for a 90-something endurance athlete (that is to say, it’s very good — and equivalent to that of a sedentary 80-year-old), it wasn’t off the charts. She does, however, seem to have exceptional muscle fibres that allow her to excel in power sports.

Russell Hepple, associate professor in the Department of Kinesiology and Physical Education and the Department of Medicine (Critical Care Division), is doing an ongoing analysis of a muscle biopsy taken during Kotelko’s visit. Hepple doesn’t agree with the common belief that people preferentially lose type 2 muscle fibres (the fibres responsible for power and strength, as opposed to the aerobic-focused type 1 fibres) as they age. Olga Kotelko just might prove him right, “because she is, after all, a power athlete doing powerful things.”

The science of aging

By 2031, one in four Quebeckers will be 65 years or older. We can’t stop aging, but we can stay strong. By studying some exceptional senior athletes, McGill researchers are hoping to learn how all of us might enter our golden years healthier and happier.
The former Mayor of Bogota, Enrique Peñalosa, once said, “A developed country is not a place where the poor have cars. It's where the rich use public transport.” Cities around the world, including Montreal, are focused on increasing the use of public transportation—but it takes time and investment. Now McGill researchers have found that simple changes to improve bus flow may have a huge impact on reducing carbon emissions.

Marianne Hatzopoulou, an assistant professor in McGill’s Department of Civil Engineering, and her research team have created a sophisticated computer system for modeling urban traffic. They start with satellite imagery of streets, then add a second layer showing all the intersections, with details about each traffic light’s timing. A third layer adds hard data about pedestrians, cyclists and vehicles. And that’s when the fun begins.

In collaboration with the Société de transport de Montréal (STM), the researchers recently used this tool to do an in-depth carbon emissions analysis of the 165 bus route, a 14 kilometre loop serving the city’s fourth highest average weekday ridership; more than 29,000 passengers ride the 165 between downtown and the Côte-des-Neiges neighbourhood. The researchers fed their computer model with GPS data gathered from the buses, as well as detailed STM data of passenger activity and geographic details about the street grade. “Using all that data, we can simulate a second-by-second bus speed profile throughout the entire corridor, for all times of day,” explains Hatzopoulou. That profile can be used to determine the actual engine emissions of those buses; the researchers can then tweak the model to see how emissions would change if those buses were to run on different fuels.

Greenlighting clean air

“Overall carbon emissions are initially lower with alternative fuel technologies, such as biodiesel or natural gas,” she says, “but what we observed was that a very important determinant of transit emissions is traffic flow. Congestion increases engine idling and acceleration/deceleration, which together dramatically increase engine emissions.”

One way to improve flow is a technology called Transit Signal Priority (TSP). In Montreal, as with most Canadian cities, buses stop “upstream” of an intersection. This leads to a bus often having to stop twice: Once to load and unload passengers, closely followed by a second stop to wait out a missed light. With TSP, the bus communicates with the traffic light system while loading; the system adjusts traffic signal durations in order to eliminate that second stop. Hatzopoulou and her team used their computer model to predict the impact of implementing TSP on Côte-des-Neiges intersections, along with creating Queue Jumper Lanes to give the virtual 165 bus a head-start over other vehicles. The results of these small changes, which would be relatively inexpensive to implement in reality, were significant.

“We found that, just by switching to TSP and Queue Jumper Lanes—and keeping the current fuel technology—we could achieve more than 15 per cent lower carbon emissions in a single route,” says Hatzopoulou.

Rolling forward

In 2013, the researchers will begin to build a similar model, at not quite the same level of second-to-second detail, for the entire STM bus system. “Let’s say the STM were to invest in 20 new buses that run on an alternative technology,” says Hatzopoulou. “What would be the best routes to deploy those buses in order to achieve the lowest carbon emissions? A downtown route that is busy all the time? A suburban route that is busy in rush hour but empty during the day? Those answers are still not clear, so that’s our next step.”

According to a real-time study of Montreal’s 165 bus route, changing the location of bus stops would reduce carbon emissions as dramatically as using environmentally friendly alternative fuels.
Quebec’s hospitals fill managerial roles with doctors and nurses—and Vedat Verter says it’s just not the best strategy. “These individuals are highly trained, excellent clinicians and very smart—but we won’t turn around our health care system by assuming that they’ll intuitively find the right ways to manage,” says Verter, a professor of operations management in the Desautels Faculty of Management at McGill. “Other sectors don’t do this; aerospace doesn’t only hire engineers, they hire managers to work with those engineers.”

As the director of the CREATE Healthcare Operations and Information Management (HOIM) program, Verter wants to free up health care providers to do what they do best—that is, providing frontline care—by training a new kind of specialized health care manager.

By focusing on four areas—electronics and telecommunications, information systems and software architecture, operations research, and process design and improvement—HOIM aims to create managers who have the tools to tackle problems such as emergency room waiting times and accessibility to family physicians, or improve the use of state-of-the-art information and telecommunication technologies in the health sector.

Faster admission, faster healing

“Hospitals are data rich, but information poor,” says Wojtek Michalowski, HOIM faculty member and professor of health informatics and decision support at the University of Ottawa. “They produce a lot of data but are very bad at extracting information out of this data. HOIM is training people who understand what they should know. We want to make people aware of what they don’t know, so they’ll use the data to get that information.”

Although the program is only three years old, HOIM PhD students and post-doctoral fellows are already getting results. An example is the ongoing work of HOIM trainees at the Montreal Neurological Hospital. A few years ago, Beste Kucukyazici’s PhD dissertation was put into action to improve the hospital managers’ understanding of how delaying a patient’s admission to the stroke unit affects their health status when it comes time to discharge them. Now Saeid Samiedaluie, a senior PhD student, is following up on that work by studying the patient admission policies at the hospital. As for Kucukyazici, who came to study at McGill from Turkey, she just finished several post-doctoral years in Spain and the U.S., and is once again putting her expertise to work in Quebec: In the fall of 2012, she became an assistant professor in the Desautels Faculty of Management.

There are still obstacles to overcome. Nurses and physicians may be rightly skeptical of outsiders arriving with fancy new ideas about how things should work. That’s why, says Verter, it’s essential to engage collaborators on the health care front lines in all stages of this research; the program includes a network of about 50 health care providers and decision makers. “If they’re part of the work, and they’re impressed with a trainee’s research findings, it increases the likelihood that the proposed interventions will actually be implemented. Ultimately, everyone has the same goal: better care.”
Whether they’re being emotionally abused or suffering physical attacks, close to a quarter of a million Quebecers are victims of domestic violence. For more than 35 years, the McGill Domestic Violence Clinic has been helping victims to get safe—and working with perpetrators to help them stop the abuse.

Although Statistics Canada’s most recent figures indicate that incidents of spousal violence have remained stable over the past decade, that still means 1.14-million Canadians report having been physically or sexually victimized by their spouses. (Statistics Canada’s definition of “spouse” encompasses marriages and common-law relationships, including same-sex unions, as well as couples who have separated or divorced.) Quebec compares well against the national average—5.3 per cent of “married” Quebecers are victims of domestic violence, compared to 6.2 per cent Canada-wide—but that’s cold comfort for some 242,000 Quebecers who know violence on the homefront.

Founded in 1975, the McGill Domestic Violence Clinic offers help to both survivors and abusers. At the clinic, which is an internship for Master’s level students at the McGill School of Social Work, counsellors give Montrealers the tools to reassemble shattered lives—and to stop the devastating cycle from continuing. Each year, some 250 men and 50 women seek counseling at the clinic. People usually seek the clinic’s services as part of a court-ordered or youth-protection mandate.

Setting clear limits
Counsellors at the clinic use a therapeutic model, developed by clinic director Tom Caplan, called Needs Acquisition and Behaviour Change (Needs ABC). The model is applied to both group and one-on-one counseling. “Needs ABC helps clients to set appropriate limits in their relationships,” explains Caplan. For women, he says, that means “not rationalizing the behavior that is perpetrated on them, and not accepting inappropriate behavior.” If a woman appears to be in imminent danger, counselors explain the importance of seeking safe haven, even if the woman doesn’t want to ultimately end the relationship. “We want to help the women to understand, especially if they have children, how to set limits to keep everyone safe until the abuser has solved his problem.”

For the men, the focus is on understanding that being angry is okay, but reacting to that anger with abusive behavior is not. “We don’t focus on the violent behavior,” says Caplan. “Instead, we focus on the need. If I start an abuser’s treatment by focusing on the abusive behavior, he’ll think ‘This guy is just like everybody else, he wants to punish me.’ But if I ask what’s going on in his life, and he says, ‘Every time I walk into the house, my wife is on the phone,’ I might say, ‘It sounds like you’re feeling invisible.’ Once you have that connection, I can begin to challenge the behavior. I can then say, ‘If you had to do this all over again what would you do this time?’ It works very well.”

“We do not minimize the seriousness of violence,” stresses Caplan. “We try to join with the perpetrator in order to help him to understand there are more appropriate options. You can’t change behavior without first establishing that trust. If an abuser can understand why they’re acting that way, it makes it easier for them to choose better problem-solving strategies.”
Quebec is big enough to comfortably contain France, Germany, Britain and New Zealand with room to spare. Yet so many of us lead our lives on a slim ribbon at the bottom of the province. But for some 42,579 Quebecers, the sprawling, majestic north is home. Over the past 100 years, the people of McGill University have built strong relationships with the people of Northern Quebec. Whether it’s bringing quality health care to remote communities, or building the environmental knowledge needed to steward our incredible natural resources, McGill’s Quebec doesn’t stop at the 52nd parallel. Here is but a sampling of some of our recent activities.

**Dr. Paul Brassard**, assistant professor in the Departments of Medicine and Epidemiology and Biostatistics, studies infectious disease control. He works with the Nunavik Regional Board of Health and Social Services to study human papillomavirus infection in Inuit women.

**Students in the School of Urban Planning** regularly look at issues relating to northern Quebec. Recent projects include an expansion plan for the rapidly growing Cree Nation of Wemindji, identifying potential locations for residential development over the next 20 years.

**Anthropology professor Colin Scott** is interested in how indigenous ecological knowledge relates to land and sea tenure. Since 1976, he has worked with coastal James Bay Cree communities to understand their approach to resource management.

**As part of the Paquimushumwaaw-Wemindji Protected Area Project**, associate professor of Wildlife Biology Murray Humphries collaborates with trappers to understand the diets and population structures of beavers and other traditional sources of food and fur.

**Clinical field placements** are an important part of McGill’s Occupational Therapy Masters program. As part of their training, students like Naajia Isa have worked with northern Cree communities, helping elderly people adapt their lives to accommodate changing mobility and needs.

**Telehealth** is one of the ways that RUIS McGill delivers specialized health care and services as close to people’s homes as possible—which is especially important when those homes aren’t accessible by any road. McGill health care providers use telehealth across the RUIS territory, but the practice has grown particularly strong in Nunavik’s 14 villages. With the advent of satellite communications—there aren’t landlines in the far north—these villages now have the infrastructure necessary to handle videoconferencing. Now, the communities aren’t just connected to distant cities, but to themselves; nurses working alone at an outpost are increasingly using the telehealth system to get real-time video consultations from doctors and colleagues elsewhere in Nunavik.

**The Inuit communities of Nunavik** are experiencing the fastest growth rate of any area in Canada—yet their ability to build much-needed homes is the most affected by climate change. Jeffrey Cardille, an assistant professor in landscape ecology, has collaborated on a case-study of the community of Tasiujaq on the impact of permafrost thawing on infrastructure stability.

**In 1954 McGill opened its Sub-Arctic Research Station in Schefferville, Quebec.** Current research projects include those of Andrew Gonzalez, director of the Quebec Centre for Biodiversity Science, who is using northern forests to study the causes and consequences of biodiversity loss and the stability and functioning of ecosystems.

**Dr. Anne Andermann** is interested in ensuring health practitioners and policy-makers have the necessary tools for making informed decisions. As a consultant for the Public Health Department of the Cree Health Board, and a medical specialist with the First Nations and Inuit Health Branch of Health Canada, she combines clinical work, research, teaching and public health practice across the province.

Each of Quebec’s four medical universities serve a specific portion of the province under the Quebec Ministry of Health and Social Services’ Réseau Universitaire Intégré de Santé (RUIS) program, launched in 2003. RUIS McGill covers more than half the province, stretching from Montreal to the shores of Nunavik. By bringing together medical expertise from the McGill University Health Centre (MUHC), the Jewish General Hospital, the St. Mary’s Hospital Centre and the Douglas Mental Health University Institute, RUIS McGill delivers specialized medical care—which could mean flying in anyone from pediatricians and cardiologists, to speech pathologists and nurses—as well as education and research to 1.8 million Quebecers in countless hard-to-access communities.
rowing up in Montreal with a family physician mom and a general surgeon dad, Anne Zaharia got an inside look at two very different kinds of health care. Yet she still entered med school not knowing where she wanted to specialize. “When I got into clinical work, it narrowed down to a choice between internal medicine and family medicine. They’re both about providing frontline care, and that’s important to me,” says the 25-year-old, who is in her second year of residency at St. Mary’s Hospital Center, in Montreal, one of four teaching hospital centers affiliated with McGill.

In the end, Zaharia liked the versatility that comes with being a family doctor, and the need to really get to know patients. “We have to take everything into context—Who is this person? What’s going on in their lives? With family medicine, we’re looking at the whole person.”

Quebecers asked for more family physicians, and McGill University listened. A record number of students from the Faculty of Medicine are choosing family medicine residencies—and 75% of students who do their residencies in McGill hospitals stay in Quebec after graduation.

McGill’s Faculty of Medicine has heard Quebecers’ need for more family doctors, and it’s doing something about it. Quebecers have it the worst, with some of the country’s overall lowest access rates. The problem is compounded by a demographics challenge: A bigger elderly population and the proliferation of chronic diseases means more demands on the health care system. McGill’s Faculty of Medicine has heard Quebecers’ need for more family doctors, and it’s doing something about it.

The doctor will see you now

A common Canadian complaint is the difficulty in finding a doctor—and Quebecers have it the worst, with some of the country’s overall lowest access rates. The problem is compounded by a demographics challenge: A bigger elderly population and the proliferation of chronic diseases means more demands on the health care system. McGill’s Faculty of Medicine has heard Quebecers’ need for more family doctors, and it’s doing something about it.

The doctor will see you now

A medical team at the CLSC de Côte-des-Neiges provides care to young Patrick-Arnold Rudkin. From left to right: medical student Imene Ait Mohamed, Nursing student Rosalita Jn Pierre and the Dean of the Faculty of Medicine, Dr. David Eidelman.

Family medicine: Meeting Quebecers’ growing needs.
The Write Stuff

For 20 years, McGill’s Department of French Language and Literature has been an incubator of literary talent—to the delight of readers across Quebec.

The Governor General’s literary awards are Canada’s most prestigious distinction for French language writing—and the G-G short-lists from the last few years look suspiciously like a roll-call of graduates of McGill’s Department of French Language and Literature. The 2012 short-list included Paula Wilhelmy, for her novel Oss (which began as her McGill master’s thesis), Yannick Roy, for his essay collection La révélation inachevée: le personnage à l’épreuve de la vérité romantique, and Dominique Fortier and Alain Roy for their translation work. (Alain Roy won, too.) During the previous three years, Dominique Fortier was also on the short list, along with Nadine Bismuth, Julie Mazzieri and Mélanie Vincelette, all graduates of McGill’s DFLL—and, in fact, Mazzieri won the prestigious literary contest in 2009 for her novel Le Discours sur la tombe de l’idiot. This hot streak is testament to individual talent and hard work, of course, as well as the quality of education in the department.

Smaller, more dynamic

“There’s a vitality in our department that’s been particularly remarkable over the past 20 years,” says François Ricard, who taught at McGill for almost 40 years and was director of the department from 2001 to 2005. He’s a distinguished man of letters in his own right, too, having won a Governor General’s Award and a 2009 Canada Council Killam Prize. Ricard has seen the department undergo a profound transformation in recent years. “It is now much smaller,” he says, noting that French language instruction moved to the French and English Learning Centre (the DFLL now focuses on literature and translation), “but it is much more dynamic. Our professors are very involved in Quebec’s literary and intellectual life.”

With approximately 100 undergraduate students and as many graduate students, and 14 professors, the department affords the opportunity to discuss literature in small groups—undoubtedly a big selling point. “Our department has a real community feel and offers an environment that fosters students,” says professor Isabelle Daunais, the department’s director of graduate studies. “The students get to know each other and there is a strong sense of belonging.” Novelist Olivia Tapiero, for one, has said that she chose the program precisely for its small undergraduate classes—and she was still in her first year of studies when she became the youngest author to win the Prix Robert-Cliche, for her debut, Les murs.

The Rivard effect

In addition to the small classes, there’s another factor behind the department’s outstanding track record: the novelist Yvon Rivard. Perhaps best known for Les Silences du corbeau (winner of the 1986 Governor General’s literary award), Le Milieu du jour and Le Siècle de Jeanne (winner of two Grand Prix du livre de Montréal), Rivard taught in the department from 1973 to 2008, and established its creative writing program. “Yvon Rivard was hugely instrumental in my life,” states Nadine Bismuth, author of the critically acclaimed Scrapbook and Êtes-vous mariée à un psychopathe? She credits Rivard with the publication of her first collection of short stories, when she was still a student in his class.

Yvon Rivard officially retired in 2008, but continues to receive and read the manuscripts of his former students. “They’re a bit like my children,” he says. “I feel tied to them.”
A place for innovative ideas to grow

When you hear the words “urban renewal,” two opposing ideas may spring to mind: the small-scale project, like converting a vacant lot into a community garden, or the kind of massive redevelopment that wipes out a neighbourhood’s special character. But those extremes aren’t the only options. The Quartier de l’innovation wants to show Montreal that meaningful grassroots connection and big-picture ambition can join together to build sustainable economic, cultural, social and educational prosperity.

The Quartier de l’innovation, a co-initiative of McGill and the École de technologie supérieure (ÉTS), aims to revitalize parts of Griffintown, St-Henri and Pointe-St-Charles, turning the southwest Montreal area into a live-work neighbourhood that will bring together academic programs, cutting-edge artists, student internships, state-of-the-art technology, visionary entrepreneurs and nonprofits, community organizations, and established companies large and small—as well, crucially, as the necessary support services.

The goal is to create a “living lab” where science and technology are publicly accessible, and to develop a new model for solving urban challenges and enhancing community collaborations.

“The QI will be an ecosystem to consolidate the things that support innovation, rather than just consolidate the activities themselves,” says neurology professor Phil Barker, who led the initial internal QI planning committee. “We’re talking about designing something that fosters technological innovation, but also innovation in social, cultural, educational and urban development—and to do that well, we need broad consultation and partnerships.”

Researchers in the McGill Institute for the Study of Canada and the Department of Art History and Communications Studies have conducted interviews with stakeholders already living and working in the neighbourhood—artists, gallery curators, café owners, community leaders—to learn about the kinds of activities already underway, and to understand current residents’ hopes and concerns for their neighbourhood’s future. The QI team also benchmarked the best practices that have allowed the world’s successful innovation districts to fulfill their potential as creativity incubators. Representatives from many of these districts—including GIANT in Grenoble, 22@Barcelona, and the UK’s Corridor Manchester—came to Montreal in October 2012, to partake in an innovation summit.

McGill and ÉTS are investing their collective human and intellectual resources in a collaboration with the existing community to create what Raphaël Fischler, a professor in McGill’s School of Urban Planning and a QI advisor, sees as “a hybrid between the two kinds of innovation districts that we’re used to seeing around the world: the techno blocks—university campuses, corporate campuses, state-owned high-tech parks—and the organic, Mile End-type of unplanned creative ecosystems that spring up when young people gather for affordable housing.”

Dr. Rose Goldstein, McGill’s Vice-Principal (Research and International Relations), says that it will be important to protect and augment the creative community that is already in the area.

“The QI project is about reflecting the core values of McGill,” she adds, “such as an active pursuit of innovation and partnership, a commitment to sustain-ability, the promotion of interdisciplinary collaboration and a belief that universities have a responsibility to take part in and give back to their communities.”
With Quebec engines sucking up more than 8.5 billion litres of gasoline each year, getting off our fossil fuel diet isn’t going to be easy. But a new, Quebec-based super-team of academics and industrial partners is working to develop the biofuels of tomorrow—and the engines to burn them.

Innovation rarely happens in isolation. Collaboration is the key to answering big questions, and one of the biggest questions of the 21st century is: What are our most viable, most sustainable options to oil and gas? Jeffrey Berghorson did post-doc work on high-speed supersonic combustion, but by the time he joined McGill in 2006 he was thinking more and more about alternative fuels. His dean thought it might be a good idea to talk to Don Smith, a plant science professor who does a lot of work on crops that emit less—and trap more—greenhouse gases.

Introducing BioFuelNet

That was in 2006. Six years later, Smith became the Scientific Director and CEO of a new research network that wants to see biofuels account for a quarter of Canada’s transportation fuel usage by 2032. To help reach that goal, Smith made sure to bring Berghorson on board. The McGill-based BioFuelNet is a collection of academics and industrial partners from across Canada that’s working fast to wean the country off oil. (The project is funded under the Government of Canada’s Networks of Centres of Excellence program.) The researchers are breeding inedible, low-impact crops, figuring out how to convert those crops (and even waste products from agriculture, forestry and your dinner plate) into fuels—and people like Jeffery Berghorson, who’s leading the BioFuelNet Utilization Theme, are designing efficient engines to burn them.

Working in McGill’s Alternative Fuels Lab, Berghorson is tweaking jet engines and gas turbines in order to get the biggest waste-into-energy bang for the buck. The question is not whether alternative fuels burn—we already know that any hydrocarbon burns in the heat and pressure of an engine. Rather, Berghorson studies how they burn. How do their physical and chemical properties affect the performance of the engine? And does nasty stuff come out of the proverbial tailpipe?

Burning questions

Berghorson himself is experimenting with different blends of alternative fuels, to see what happens to the sequence of chemical reactions that converts fuel and air into carbon dioxide and water. This includes extinction behaviour (how easy it is to blow out the flame), flame speed and stability; type and quantity of emissions; fuel droplet evaporation; and reignition at low temperatures. Berghorson has also adopted an experimental and modelling approach that allows him to assess the effect of industrially relevant turbulence levels on the flame without using an actual combustor—and without cramming a jet engine into his lab. The results will inform other research work to integrate alternative fuels into transportation and power generation systems and help develop new engine designs that improve efficiency and reduce emissions.

“Ideally, a customer cares about geometry, cost, and reliability,” says Berghorson. “But increasingly, they are asking if they can burn alternative fuels. Bio-derived fuels are now being shown to be engine-compatible and carbon friendly. The industry is already certifying hydro-treated vegetable oils, thereby opening the doors for widespread adoption.” Is a biofuel world around the corner? It’s going to take some work, but it just may happen sooner than you think.
McGill University and Montreal have grown up together. In 1829, a handful of students gathered in a small building located on the outskirts of Montreal, then a small port town nestled on the banks of the St. Lawrence. Nearly 185 years later, that small town has become a cultural capital of world renown. And that small building grew into one of the largest research universities in the world. Today, McGill University is a key player in building prosperity and innovation in Quebec.

**Excellence**

- 134 Rhodes fellows and nine Nobel Prize laureates—more than any other University in Canada
- 1st in Canada among medical-doctoral universities for the last 8 years (Maclean’s University Rankings 2012)
- 18th in the world and 1st in Canada for the past 9 years (QS World University Rankings 2012)
- 1st or tied for 1st amongst Canada’s large universities in information technology, city satisfaction, reputation with employers and libraries (Globe and Mail’s Canadian University Report)

**Budget**

- Operating budget of $715-million (2012-2013) and a research budget of $510-million (including affiliated hospitals)
- McGill has an economic impact in Quebec of $5.2-billion, according to SECOR (study published in 2010)
- AA credit rating (stable Outlook) by Standard & Poor’s

**Students**

- 38,826 students
- 54.1% come from Quebec
- 25.5% come from elsewhere in Canada
- 6,782 students have French as a mother tongue
- 60% of students report that their French is good or excellent
- McGill is Canada’s most international university, with 20% of its full-time students coming from 150 countries
- In five years, McGill has increased financial assistance to students by more than 500%

**Employees**

- 11,000 employees on campuses, including 1,636 faculty (tenure and tenure-track)
- Among the top 100 employers in the country (Mediacorp Canada 2012)
- Third of the five most attractive employers in the country (Randstad 2011)

**McGill by the Numbers**

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