intersections

Ryerson University Research and Innovation 2010

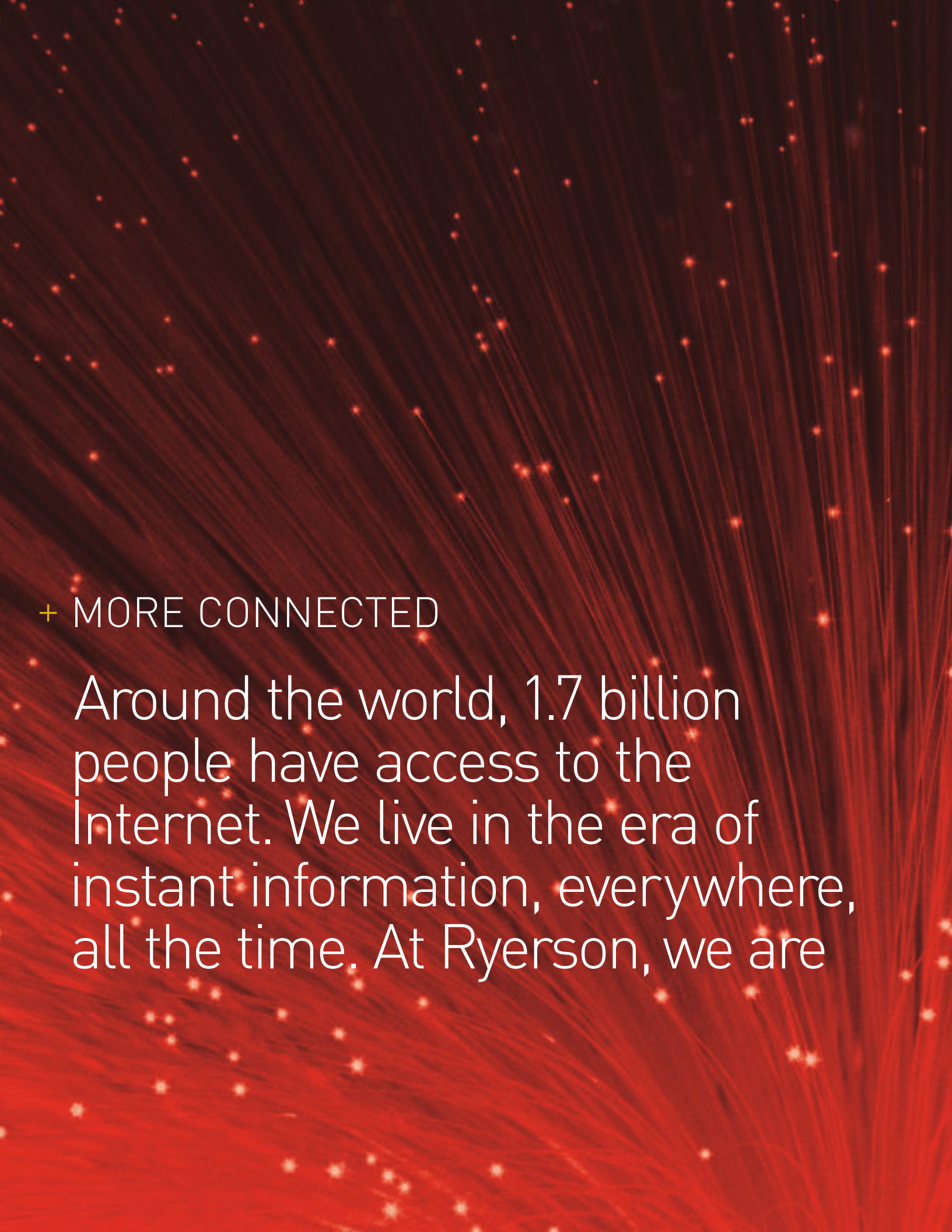
RYERSON UNIVERSITY

Everyone Makes a Mark

New day. Research at Ryerson is shedding light on issues that matter to all of us.

COVER: Airglow layers at Earth's horizon are captured in this remarkable photograph taken by a crewmember of the STS-122 mission aboard space shuttle Atlantis.

+ BETTER



+ MORE CONNECTED

Around the world, 1.7 billion people have access to the Internet. We live in the era of instant information, everywhere, all the time. At Ryerson, we are


exploring the new frontiers
of information technology
and harnessing the benefits
of connectedness.

+ MORE COMPETITIVE

Even the smallest enterprise is part of the global marketplace on our shrinking planet. Between 1998 and 2007, Canada fell from 6th to 14th on the international Global Competitiveness Index.

As we move into a new global economic order, Ryerson is working with industry and government partners to give Canadian business a competitive edge.

+ MORE HEALTHY

In the least developed countries, life expectancy is now less than 40 years, and it's falling. In Ontario, the cost of health care represents 43 per cent of the provincial budget, and it's rising.

Researchers at Ryerson are finding new ways to keep people well, diagnose them early, help them get better and make the health system work.

+ MORE SUSTAINABLE

There's no longer any doubt. Climate change is happening and human activity is the primary cause. Air and water pollution, habitat loss, species loss — sometimes the challenges


seem overwhelming.
At Ryerson, researchers are looking for ways to reduce our carbon footprint and address other pressing environmental issues. Now. Before it's too late.

+ RESEARCH TOWARDS A BETTER FUTURE

It was an intriguing idea. A group of students proposed a new research model where the first step would be inviting the world into the lab. Enter the Ryerson Digital Media Zone (DMZ). Initiated and run by students from a range of disciplines, DMZ research is tackling problems posed by industry, business and the public and private sectors. Student projects are under way in Stockholm and Paris, and interest is growing.

Research at Ryerson is attracting exceptional students, post-doctoral fellows and faculty from esteemed universities around the world. Opportunities for undergraduate research are an integral component of our programs. While Ryerson offered its first graduate programs only ten years ago, the past decade has seen phenomenal growth, with more than 40 programs and more than 2,000 students. Demand for spaces is very high and extremely competitive.

This second edition of Intersections profiles a representative group of our dynamic student researchers and scholars. I invite you to take time to browse through the pages. You will learn that Ryerson research happens in interesting places and ingenious ways, with a nimbleness born of our youth, edgy academic culture and the absence of boundaries separating our campus from downtown Toronto and all it has to offer. Discovery happens with every step, and our university is a tremendously vibrant place to be.

Ryerson leadership builds on its history in believing that academic knowledge inherently includes the responsibility to use innovation to address real and anticipated challenges. As these stories and many others at our university illustrate, Ryerson is leaping forward to define the direction of research in the 21st century.

Sheldon Levy
President

We all want ourselves, our families and our society to live better.
We want to live healthier, safer, more vibrant lives, in a society that is more humane, competitive, connected, and ultimately more sustainable. Researchers at Ryerson are focused on finding practical ways to make better happen.

This ethos, which sets us apart from more traditional universities, is in part a result of our history. Ryerson started life as a polytechnic, so we have always been about real-world, hands-on learning. It's natural for our investigators to tackle important issues facing society.

Our culture also reflects our location in the heart of a vibrant and cosmopolitan urban centre. The energy of the city feeds our research enterprise, and we in turn focus on problems important to the future of the city and its inhabitants.

The research culture at Ryerson is marked by freedom and flexibility. There are opportunities to collaborate across disciplinary lines. We encourage our researchers to take risks and explore new approaches. In practical terms, we provide them with assistance, seed funding, administrative support, and more.

It's working! We've seen significant growth in research funding, with a 23 per cent increase in 2008 alone. Ryerson ranked number one in publications growth for Canadian undergraduate universities from 2002 to 2007, with a dramatic 171 per cent increase.

Perhaps most exciting, we are beginning to see the fruits of our labours — not only in increased research funding and publications, but in impact on the real world. We are committed to maintaining the momentum. We are making a better university, and in the process, a better city and a better society.

Anastasios (Tas) Venetsanopoulos
Vice-President, Research and Innovation

NEW IDEAS, BETTER FUTURE.

Ryerson encourages students at all levels to discover the joy of research. Students are asking important questions, honing critical skills and making high-value discoveries.

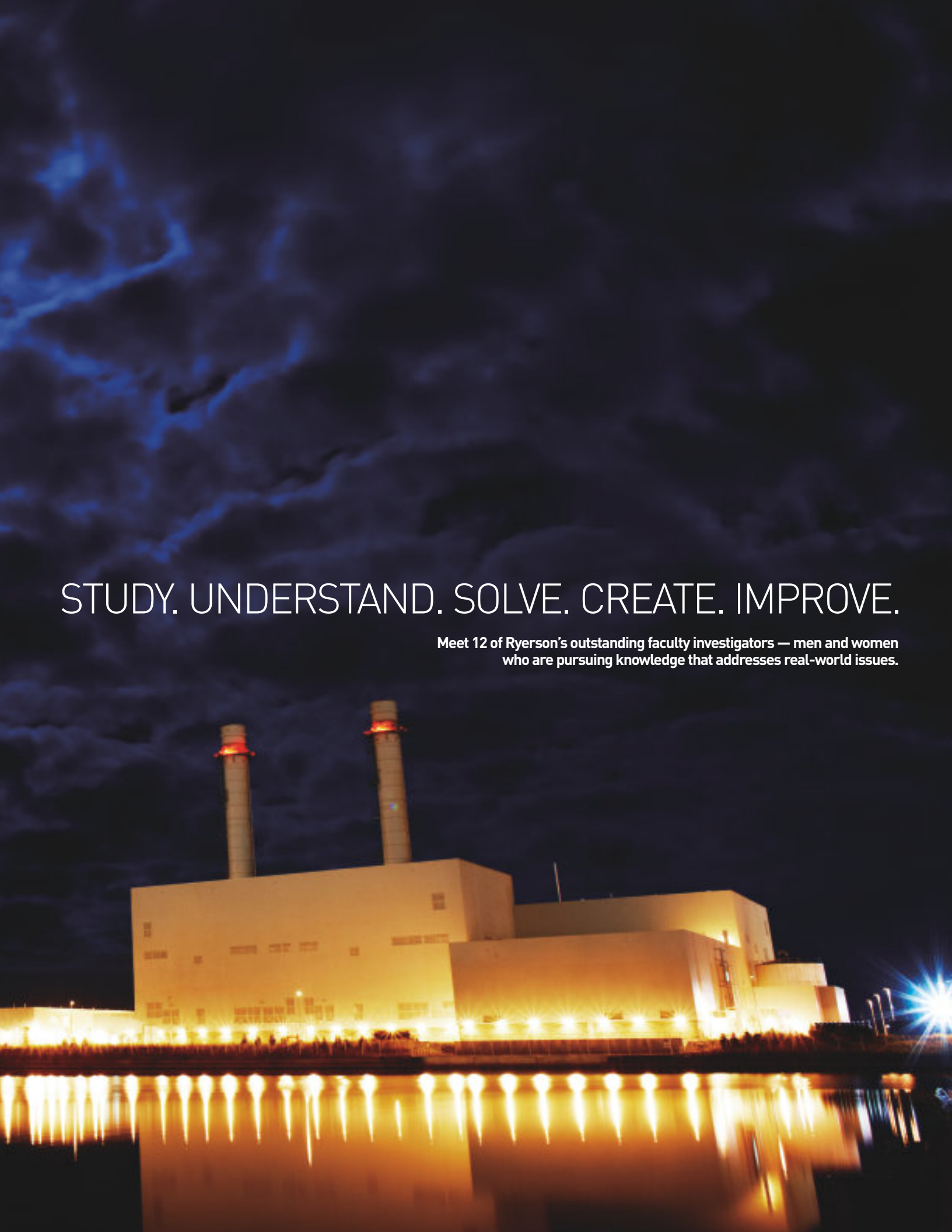
"I want to bring students from journalism, fashion, social sciences, computer science and other disciplines together to come up with better research questions, get hands-on experience and maybe even commercialize their ideas."
Hossein Rahnama, PhD student, is a pioneering researcher in context-aware computing.

"Participating in research has improved my writing skills and my communication skills with patients. It has taught me how to work in a team, do systematic reviews, input and analyze data and write papers. I'm more organized and better at self-management, too. Doing research has opened my eyes to a new world, and I've fallen in love with it!" Sarah Ibrahim, fourth-year student in nursing. She has been involved in two major research studies exploring patient self-management and nursing education.

"In the knowledge economy, entrepreneurship is the future. Ryerson is the best place to do entrepreneurship research because we're practically focused, not an ivory tower. We're at Yonge and Dundas — we're living in the environment!" Marko Hrelja, fourth-year student, Ted Rogers School of Management, is investigating neuro-entrepreneurship.

"Ryerson was my top choice for a grad school. There's a buzz around the new psychological science program and the research that's happening in the brain imaging and memory lab. Ryerson's research culture is very open and we're encouraged to pursue a diverse range of research opportunities. That will be critical when I finish my PhD and start looking for a post-doc or a job."
Meera Paleja, PhD student, psychological science, is using functional MRI technology to explore spatial memory and cognition.

POWER FULL: Bin Wu works with industry partners to create energy-saving variable-speed drives, which are good for business and good for the planet.



STUDY. UNDERSTAND. SOLVE. CREATE. IMPROVE.

Meet 12 of Ryerson's outstanding faculty investigators — men and women who are pursuing knowledge that addresses real-world issues.

DRIVEN TO SUCCEED: Many immigrant professionals end up driving taxis or taking other lower status jobs when they arrive in Canada. Sepali Guruge's research suggests that underemployment may contribute to intimate partner violence in immigrant communities.

Stemming the Violence
Sepali Guruge

When Sepali Guruge started her nursing program, she struggled with English, her third language. But by her fourth year, her papers were being accepted for publication. A commitment to nursing research and education was born.

Guruge's research program focuses on violence against women. Her interest arose in part from her experience as a nurse at the Centre for Addiction and Mental Health. "I began to realize how prevalent this issue is, and how damaging it can be to people's lives. Violence against women has a drastic effect on physical and mental health, not only for the woman but for the whole family." Statistics suggest that between 30 and 50 per cent of Canadian women have experienced violence in the context of an intimate relationship.

Guruge has a special interest in the experiences of immigrant women. She has discovered that a diverse range of factors contribute to intimate partner violence within immigrant families, including factors relating to the cultural norms of their home countries, the violence they may experience while leaving home and their experiences after arriving in Canada. For example, stresses may build up between a husband and wife who are both working long hours at menial jobs to make ends meet in Canada, especially if they were accustomed to a higher professional status in their home country.

To understand the pre-migration experience, Guruge has done extensive research in Ethiopia and Sri Lanka. She narrowly avoided a bomb blast during one of her visits to Sri Lanka. "There is a risk," she admits, "but it's important that we do this work in countries where access to resources is minimal."

Guruge says understanding the factors involved in violence against women is the first step toward providing good care. "We need culturally and linguistically appropriate services, access to shelters, legal and psychological counselling and more," she says. "It's also critical that we educate nurses so that they are comfortable asking about violence and conducting risk assessments."

Ultimately, Guruge says, violence against women is an issue we must all grapple with. "We have to work as a society toward addressing patriarchy, sexism, heterosexism and other issues, because only then can we come to lasting solutions."

Conserving Energy, Creating Competitive Advantage
Bin Wu

The massive fans used during the production of cement are generally driven by fixed-speed motors, which often run faster and use more energy than necessary. Bin Wu has a solution.

Working with long-time industry partner Rockwell, Wu and his team are developing high-performance variable-speed drives for large-scale motors used in industrial processes like those related to cement, mining, petrochemicals and power generation. "Variable-speed drives can have a huge economic benefit," says Wu. "Although they're quite expensive, companies can get their investment back in energy savings in less than three years." Variable-speed drives are also more adaptable and accurate. "By developing and adapting new technologies, Rockwell has become a leader in the global market," Wu says. The company produced only a few units in 1993, but is now making 600 to 700 units a year.

This project is one of several underway in Wu's Laboratory for Electric Drive Applications and Research. The lab, which is among the best of its kind in Canada, has been strongly supported by the Canada Foundation for Innovation (CFI) and several industry partners. Wu holds the NSERC/Rockwell Industrial Research Chair.

Wu's team is also working on wind energy systems. Rockwell is interested in adapting its specialized current source converter technology for use in high-powered wind turbines, such as those used in offshore wind farms. Wu recently received funding from CFI to set up a six-turbine wind farm in Fergus, Ontario for research purposes. →

In addition, Wu has a partnership with Honeywell Aerospace for the development of a next-generation motor controller to regulate the airflows and environment in aircraft cabins. "Because it's for an aerospace application, we have to develop a new technology," he says. "It has to meet military requirements and not generate magnetic or electrical noise that could interfere with an airplane's navigation systems. And of course, it has to be compact, lightweight and very reliable."

Wu says his work is well supported by his department, the faculty and the university. "Ryerson is a good place to develop collaborations for applied research that's relevant to industry."

Keeping Our Water Clear and Clean
Lynda McCarthy

When Lynda McCarthy was in Grade 4, her teacher took her class to visit the then-nascent Canada Centre for Inland Waters. It was a life-changing experience.

"It was just trailers sitting on a mud flat," she recalls. "But they told us they were going to save the Great Lakes and I decided that one day I was going to work there."

McCarthy worked at the centre as a university student, and stayed on through her PhD and post-doctoral studies. During the summers, she spent most of her time on the centre's research vessels. Today much of her work is still focused on water quality.

She and her interdisciplinary team have developed a real-time early warning system for drinking water systems that she refers to as "the miner's canary." In the past, coal miners carried a canary underground with them to act as an early warning system for toxic gases. If the bird became ill, it was a sign that the air was bad for miners too. In McCarthy's version, a selection of aquatic organisms is exposed to potentially contaminated water and then observed for behavioural changes. "There are more than 10,000 chemicals in our environment and we have standards for maybe 100," she says. "And ultimately, toxic impact can only be assessed by a living thing." The system is currently being piloted, and McCarthy hopes it will soon be in use at a First Nations community struggling with health and water quality problems. "Sure, they have chemical analysis," says McCarthy, "but they aren't measuring for all the millions of possible combinations of chemicals. We want to bring in our 'miner's canary' and ask the organisms if they are hurting." Ultimately, McCarthy sees this approach as a workable solution for developing countries that may not have the resources for expensive chemical analysis.

In a related body of work, McCarthy is exploring the impact of using biosolids — processed sewage sludge — as fertilizer on farm fields. Her team is studying the behaviour of earthworms and springtails in soil with and without biosolids by running short-term avoidance and longer-term reproductive tests. So far, the results are positive for the use of biosolids, but there is more work to be done.

McCarthy says Ryerson is a healthy environment for her research. "At this university it doesn't matter if your name is first on the list of authors," she says. "The focus here is on coming up with a solution that works."

Shining a Light on Health
Victor Yang

When Victor Yang was growing up, he often watched his father using a CT scanner in his lab at Peking University. Now, many years later, Yang is a leader in the development of a new imaging modality with enormous potential.

Yang's family immigrated to Canada when he was in high school. While training as an engineer, he worked at the Ontario Cancer Institute doing experiments with lasers, work that eventually turned into a master's thesis. Recognizing that his lack of medical knowledge held him back, he enrolled in medical school, and then completed a PhD in medical physics and a residency in neurosurgery.

Today Yang's research focuses on optical coherence tomography (OCT), which uses tiny optical fibres, originally developed for the telecommunications industry, to image the human body. OCT is safer than X-ray technologies and much less expensive than MRI devices, and provides more precise images than ultrasound. Yang and his team are working to optimize OCT so it can be used for a variety of medical applications.

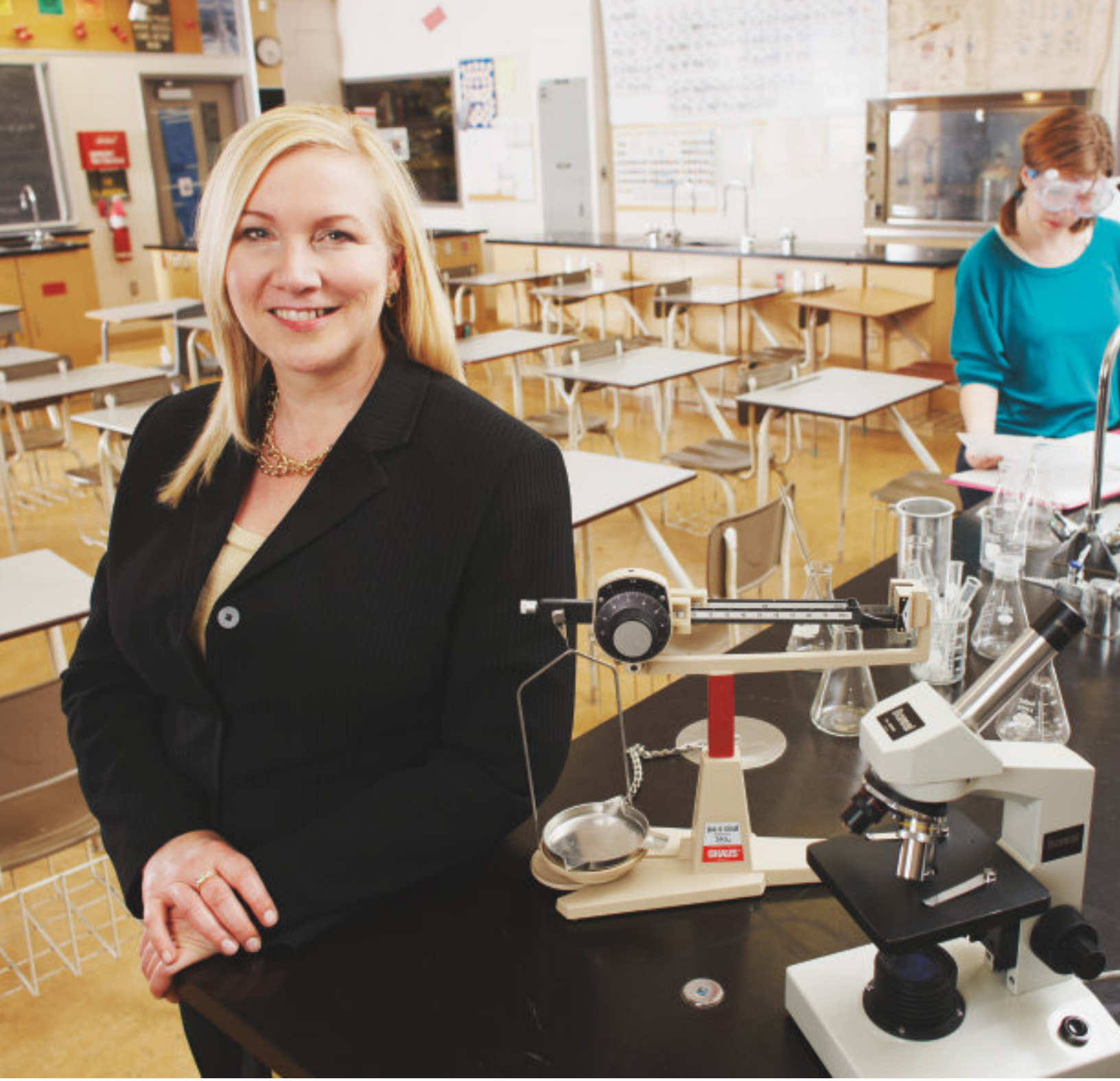
For example, Yang is using OCT to image the abnormal blood vessels that develop to feed cancerous tumours. The goal is to design optical waves that can destroy the blood vessels and ultimately, the tumours. OCT is already being used to image the coronary artery (the vessel that brings blood to the heart), and Yang has developed a more effective method of helping physicians guide their catheters through the artery. OCT can also be used to monitor response to new drug treatments, especially those that attack blood vessels.

Yang holds a prestigious Canada Research Chair. "It gives me a stamp of approval," he says, "and that helps me build local and international collaborations and maintain continuity in my team." He also works with researchers at University Health Network, St. Michael's Hospital and Sunnybrook Health Science Centre.

To simplify his busy life as a surgeon and researcher, Yang lives a few minutes from Ryerson and St. Michael's Hospital. "I've seen a critical mass developing at the university," he says. "Ryerson has taken a very liberal, user-friendly approach to developing its research programs. We're able to take courageous steps that might not be possible at another institution."

TWEET, TWEET: The lessons of Walkerton are still fresh. Lynda McCarthy uses a miner's canary approach to detect hazardous contaminants in our water.

BIG PICTURE: Victor Yang is a surgeon, so he knows how important it is to have clear images to guide you when operating in tiny, complex structures. His work in optical coherence tomography will help surgeons see as clearly as if they were operating on a dinosaur, instead of a human.



MAKING CHOICES: Wendy Cukier visits a Grade 10 physics class in her quest to understand why girls often turn away from studying science and technology. Is there something we can do to make less conventional career choices more attractive?

Advocating for Diversity and Gun Control

Wendy Cukier

Wendy Cukier's research interests are a reflection of her personal experiences and passions.

As a telecommunications consultant, she wondered why the benefits of technology were often overstated. A crammed e-mail inbox got her asking questions about spam. Working in a male-dominated environment started her thinking about women and technology. And teaching at a university when the Montreal massacre happened 20 years ago focused her attention on gun control issues.

Cukier is anything but a dilettante in these diverse areas. She is a respected scholar on subjects ranging from telecommunications, electronic commerce and digital media to social marketing, public policy and diversity.

Cukier has long been interested in the way people think and talk about technology. She recently completed a three-year project analyzing discourse about e-learning, e-business and the information highway. In other technology-related projects she has explored the role of narrative in spam, with a special interest in the so-called "Nigerian letters." A new study will explore ways to measure the effectiveness of social media. "The Obama campaign was so successful that everybody wants to have a social media strategy," she says. "But that campaign was highly structured and well resourced. I think some organizations are being oversold on social media."

Her work in diversity studies began in the late 1990s when the curriculum in her department changed from administration and information management to information technology management, and the percentage of women students plummeted. Cukier began exploring the barriers that prevent women from participating in technology, an interest that contributed to the establishment of Ryerson's Diversity Institute in Management and Technology. The institute has published several influential studies and helped make Ryerson's MBA program a leader in the field.

Deeply touched by the events of Dec. 6, 1989, Cukier is co-founder of Canada's Coalition for Gun Control and a founding member of the International Action Network on Small Arms. Her 2006 book, *The Global Gun Epidemic: From Saturday Night Specials to AK-47s*, has been heralded by advocates and academics alike.

Cukier says Ryerson's open research culture and focus on real-world relevance and community linkages have given her the freedom to delve into many different fields of inquiry. "The culture here is evolving, not restrictive, and I have wonderful colleagues ready to collaborate," she says. "That kind of community makes all the difference in the world."

Telling Powerful Stories in New Ways

Richard Lachman

Got a few minutes to spare? Why not assemble a spaceship in near-Earth orbit and fly it to Mars? You'll have fun manipulating the robotic arm, and learn a thing or two in the process.

OnOrbit is one of six games created for RaceToMars.ca by Richard Lachman, a professor in the School of Radio and Television Arts, and his team. The remarkable website, designed to accompany the Discovery Channel Canada series of the same name, won the 2008 Gemini Award for best cross-platform project.

RaceToMars.ca is an example of the emerging art of trans-media storytelling, and Lachman is one of its leading practitioners. After completing a BSc in computer science at MIT and a masters at the MIT Media Lab, Lachman worked for a company in San Francisco creating lifelike artificial characters for the games industry. After the company was sold to Mattel, he moved back to Canada to work as a consultant on several projects that combined television and the Internet. The job at Ryerson was an opportunity to combine his academic interests with industry connections and an endless fascination with "making things."

The games in the RaceToMars.ca project are part of a new area of research called "serious games." They are designed to be fun, yet are based on detailed scientific research. Users have the opportunity to absorb information, solve problems and learn by doing. Lachman is currently working on a version of the games that will be used in schools, and another that may be used by the Canadian Space Agency as a training and cognitive assessment tool.

He has also done groundbreaking work for the interactive documentary *Diamond Road,* exploring the global diamond trade.

The documentary's website allows users to experience, combine and rework content to produce their own versions of the story, using a spreading-activation-net software recommendation system. "It's still a carefully edited story," says Lachman, "but there are many directions the filmmaker could have taken the linear narrative. We're exposing those different directions and giving the user some control over the story they are told."

At a time when traditional media are under assault, Lachman believes it's important to explore new creative and business opportunities in the multimedia environment. "Content is still compelling," he says. "It is just that there are many ways we can tell stories in addition to standard linear television."

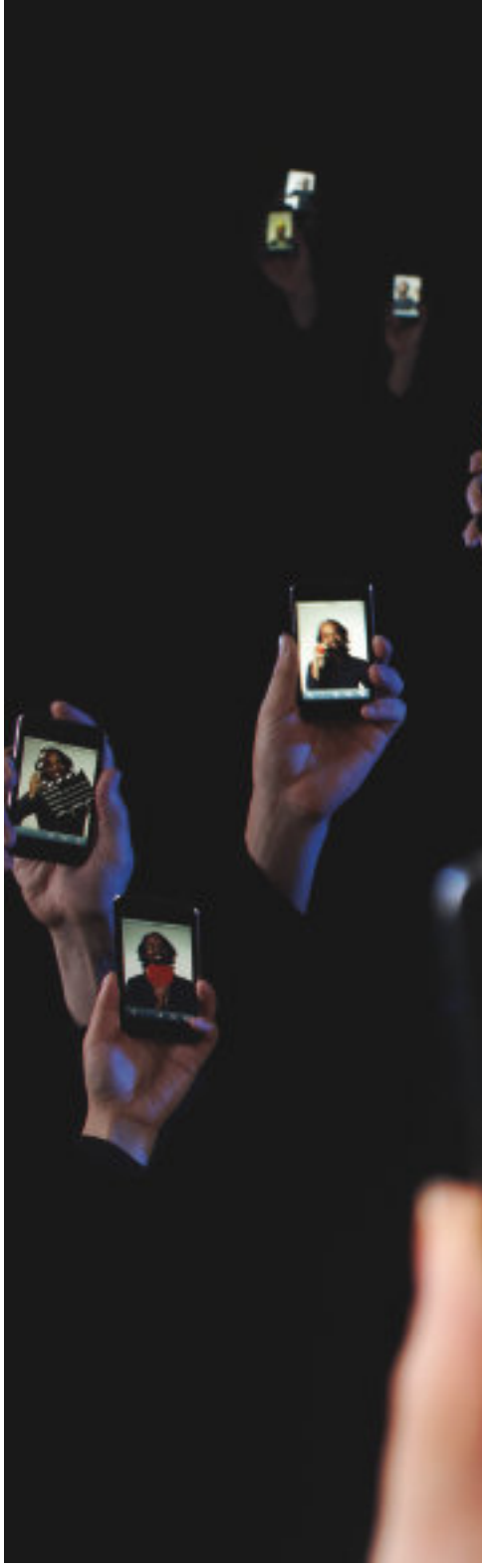
Helping Us Sleep Tight

Colleen Carney

Colleen Carney always knew she would have to leave Ontario to get training in the field of sleep medicine, but her dream was to return and establish a world-class sleep program. Dream realized.

Carney completed a PhD at Louisiana State University and then started working at Duke University. Shortly after receiving a grant from the U.S. National Institutes of Health to conduct a large-scale clinical trial, she applied for a position at Ryerson. The university hired her and built a two-bed sleep lab to support her work.

Depression and insomnia often go hand-in-hand. Carney's earlier research had shown that even when depression is successfully treated, many people are left with insomnia, and they, in turn, are more likely to have a relapse into depression. There is also evidence that people with significant insomnia respond poorly to conventional depression treatments. →



CHOOSE YOUR OWN ADVENTURE: Richard Lachman explores compelling new ways to tell stories by, for example, allowing viewers to build their own movies using micro-narratives available on portable devices.

CATCHING ZZZZS: Life in the city can be crazy. Colleen Carney is exploring the interaction between depression, insomnia and daytime activity.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The clinical trial compares three treatment options for people with depression and insomnia: cognitive behaviour therapy for insomnia only, conventional therapy for depression only, or therapy for both insomnia and depression. "Of course we think the combined treatment will be the most effective," says Carney, "but we're interested to see if there will be some people in the insomnia-only treatment group who recover from depression. We want to be able to predict who those people are." She points out that depression therapy is long and costly and can sometimes cause or worsen insomnia.

As part of the trial, participants wear a wristwatch-sized motion sensor monitor that records their periods of activity and rest, and allows them to rate their fatigue throughout the day. The data will be used to look at the interaction between daytime activity and insomnia. Students working with Carney are also looking at whether people with insomnia are afraid of the dark, and whether certain types of music can help them feel better when they're tired.

Carney hopes her research will have a direct impact on the way sleep medicine is practiced. Her lab trains graduate students in cognitive behaviour therapy and she is working with a researcher in nursing at Ryerson to develop a training program for nurses. "Ryerson is the only place for me to do my research," Carney adds. "This university is all about encouraging fresh collaborations and new ways of looking at things. People here think outside the box."

Helping Industry Etch
Marcello Papini

"What we are talking about here, in its most basic sense, is sandblasting." That's Marcello Papini explaining his research in simple terms. Simple maybe, but critical to the success of many manufacturers.

Abrasive jet technology describes the process where millions of tiny particles are launched by compressed air at very high speeds through a small nozzle. The resulting impact creates holes and channels in surfaces like glass, metal or polymer. The size and shape of the holes are determined by the direction of the nozzle, and the speed at which it passes over the surface.

The conventional way of carving or etching surfaces is with toxic chemicals. Papini has found that abrasive jet technology is faster, cheaper and more environmentally friendly. It also has the potential for micromachining a greater variety of shapes and patterns, with increasingly smaller dimensions.

For example, Papini is using abrasive jet technology to help manufacturers create microfluidic chips that are used to analyze blood or DNA. Each chip has engraved on its surface a number of microchannels, coated with a chemical that separates components of the blood or DNA sample.

Papini is applying the technology to microelectromechanical systems, which involve tiny machines that combine microelectronics with micromachining. "I am pushing the limits of this technology to reduce the size of the features," he says. "The smaller you go, the bigger the market becomes." Those who hate going to the dentist will be interested to know that one day there may be a painless alternative to the dentist's drill. In a recent project, Papini found that abrasive jet technology could be used to fill cavities without the need for freezing.

A large part of Papini's current research is focused on developing industrial tools through process modelling and computer simulation that predict the exact sizes and shapes to be carved out of a surface. "There are around a million particles per second hitting the surface and with our simulations we can model the actions of every single one," he says.

Papini, who holds the Canada Research Chair in Abrasive Jet Technology, is excited by the expansion he's seen at Ryerson since he joined the Department of Mechanical and Industrial Engineering 10 years ago. "The research here really is unique," he says. "I have great opportunities to interact with other professors, and close collaborations spring from that."

FASTBALLS: Marcello Papini (left) is developing methods of using tiny particles propelled by compressed air at high speed to etch glass, metal and polymers.

Exploring the Origins of Film
Marta Braun

One of the world's first motion photographers, Eadweard Muybridge was perhaps best known for murdering his wife's lover and then being acquitted on the grounds of "justifiable homicide."

Muybridge also established that when a horse is galloping there is a moment at which no hoof is touching the ground. The complex and contradictory artist is one of the major research interests of Marta Braun, a professor in Ryerson's renowned School of Image Arts. Braun is also director of the university's unique master's program in Photographic Preservation and Collections Management.

Braun got interested in early motion photography when she was working on a master's thesis on Étienne-Jules Marey, a French scientist and photographer. She contacted a colleague in Paris to ask a question about the exact location of Marey's lab. The friend drove out to verify the location and found a demolition crew at work. One of the crew asked her if she would be interested in the crates of old negatives they had found hidden under the roof. "It was just one of those lucky things," Braun says. "I seized on the opportunity and it led to more and more work."

Marey's motion photography was influential in the development of human and animal physiology, modernist literature, philosophy, art and psychology. His technique using a moving figure dotted with lights is the foundation of today's CGI technology, used to create special effects in movies. Braun's book, *Picturing Time: The World of Étienne-Jules Marey*, was published to acclaim in 1992. She recently helped create an online exhibition of the images salvaged from Marey's lab.

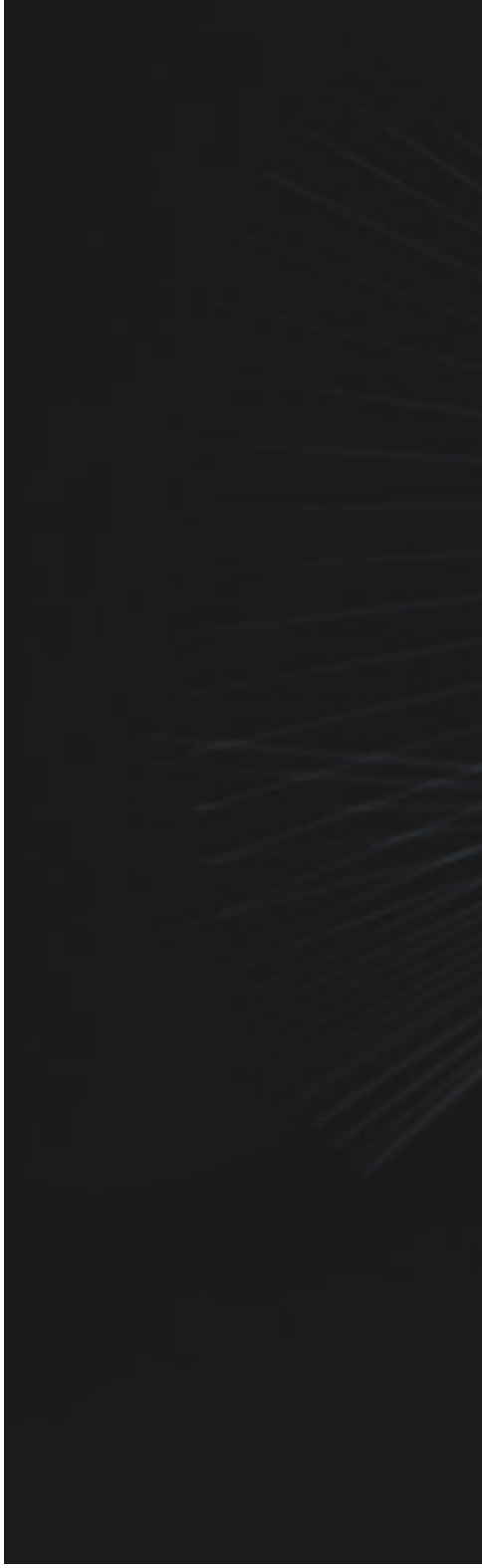
Although Muybridge's images appear to be similar to Marey's, Braun discovered that he was more interested in art than science. She is organizing a major exhibit focused on the work he did at the University of Pennsylvania in the 1870s. "This exhibit is essentially about the people, not the motion, in the photos. It turns out that these images were more than just simple studies of movement — they were about ideas of race, masculinity and sexism."

Braun says Ryerson is "simply the best place" for the work she does. "I'm very fortunate to be surrounded by people with sterling reputations," she says. "It's a progressive environment that supports people like me."

Making the World Safer for Children
Henry Parada

When Henry Parada worked with an aid organization in Latin America, he was deeply moved by the plight of children in the Dominican Republic. He knew he had to do something.

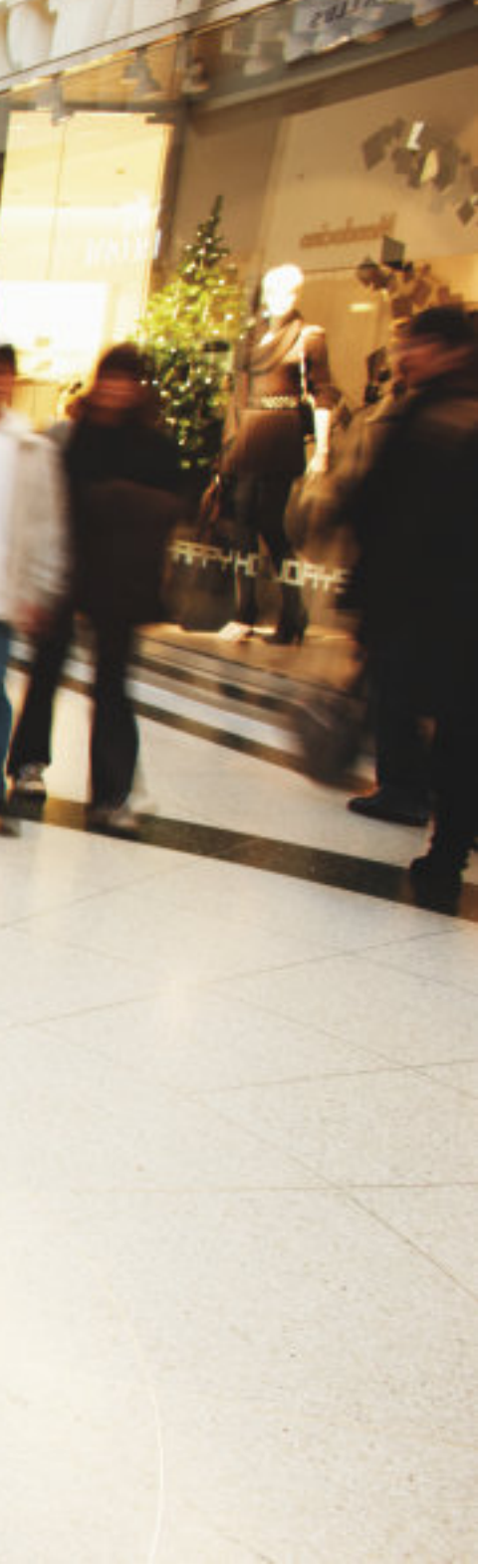
The Dominican Republic is one of the worst countries in the world for the sexual exploitation and trafficking of children. Although the country has laws and policies to protect children, it has no formally trained social workers. After Parada joined Ryerson, he came up with an innovative idea — to create a local school of social work. →



MOVING EXPERIENCE: Marta Braun demonstrates the magic of motion photography, developed in the 19th century by Marey and Muybridge.

RED LIGHT: Henry Parada's work takes him to the mean streets of Santo Domingo. By creating a school of social work in the Dominican Republic, he hopes to build a better future for children in desperate need of support and protection.

POWER CENTRE: Tony Hernandez explores the changing face of retail in Canada.



Thanks to the Child Protection and International Safety Project, the Dominican Republic's Autonomous University of Santo Domingo (AUSD) is now home to a bachelor of social work degree program. "The responsibility of a state is not just to develop policy, but to implement practices to help those who need help the most," says Parada. "It takes trained, professional social workers to do that. That's our message."

The project is funded by the Ryerson International Initiatives Fund, the Social Sciences and Humanities Research Council of Canada and a $1 million grant from the Canadian International Development Agency. It's based on a unique partnership with AUSD, and involves experts from Ryerson, Carleton and McMaster Universities.

There are now 178 students in the program, and the first class is in its sixth semester. Most students are drawn from the communities that need support, and professors at AUSD are being trained to teach and develop curricula that are relevant to the culture of the country. One of the problems in the Dominican Republic is lack of data. Students are being trained to do basic data collection and research.

Parada, with funding help from UNICEF, is also completing a study of the children's protection systems in the Dominican Republic, exploring how the social institutions of the country affect people's lives. "No one really knew what happens when a child makes contact and enters the system," says Parada. "We have met with a lot of institutions and a lot of people to collect data and develop benchmarks." Parada has been asked by UNICEF to share his study with other Latin American countries for use as a potential model.

Parada is excited about Ryerson's social work program, which is becoming a hub of international cooperation. "The support I get from Ryerson International is unparalleled," he says. "The openness at Ryerson allows you to explore a lot of things. And that makes a big difference."

Shaping the Consumer Experience

Tony Hernandez

If a brand new Walmart is about to appear in your neighbourhood, Tony Hernandez is likely to know where and why.

It's not because Hernandez loves shopping — in fact, there are lots of things he'd rather do. Hernandez, an expert in business geomatics, is the director of Ryerson's Centre for the Study of Commercial Activity. The centre, created in 1993, tracks retail data and identifies key market trends throughout the GTA and across Canada. "We look at where stores are locating, what their corporate strategies are and what it means for the Canadian consumer," he says. The retail landscape is a reflection of how we live our lives, says Hernandez. The most recent trend has been the development of "power centres," clusters of big box stores. "We refer to it as the Americanization of Canadian retailing — consumers filling up the minivan with goods."

Hernandez is also studying the changing face of major shopping malls, few of which have been built since the late 1980s. Their new look includes more entrances, innovative frontages and a different mix of brands. Malls are also welcoming big box stores onto the premises, often as stand-alone structures. →

Downtowns are getting a facelift too, particularly in cities like Toronto where the downtown population is increasing. In one study Hernandez found that downtown cores are becoming hotspots for fashion retailing.

Hernandez is also looking at the "greening" of retail. The automobile has shaped today's retail landscape, but the appeal of driving 30 or 40 kilometres to a giant mall may be fading. "There is no doubt that local retail will be more important in the future, especially if we start actually passing on some of the carbon costs that we as consumers create," he says. The centre is also looking at the aging of the population, and how that will change the nature of retail markets.

The centre is funded by more than 60 public and private sector organizations. Although much of its work is retail-based, researchers at the centre also examine questions related to health, culture, heritage and sports.

The retail sector has a huge impact on our economy and the quality of life of Canadians. Through the centre's research, Ryerson is helping developers and planners make more informed decisions that address the needs of consumers. Says Hernandez: "At the end of the day, whether we like it or not, we're all consumers."

Engineering Health
Sri Krishnan

When Sri Krishnan was an undergraduate student in electrical engineering, his uncle had a heart attack. In the hospital emergency department, as his uncle was hooked up to an ECG machine, Krishnan watched the readout and had an idea.

"It was the first spark," he says. "I felt there was something more we could learn from those waveforms."

Krishnan has pursued that idea — understanding human physiology from an engineering perspective — ever since. Today, one of his major research programs focuses on reducing the number of sudden cardiac deaths. This syndrome has been studied for many years, but researchers have had difficulty reliably identifying people at risk. Krishnan, who holds the Canada Research Chair in Biomedical Signals, believes part of the solution may lie in the complex electrical signals generated by the heart. "Once we have the signals as data, we can analyze them to find hidden clues that could help a physician make informed decisions."

Similar signal-processing approaches can be applied in the field of sleep medicine. Sleep labs gather data about patients' brain waves, eye movement, heart signals and leg muscle contractions. Krishnan and his team can then analyze the data to see, for example, how a patient is responding to a particular drug or whether sleep quality is improving.

Krishnan is also exploring the use of signal processing to analyze voice patterns for signs of emotion or underlying disease. "Once we convert speech into a waveform, I can process the data to reveal the hidden signatures." He can already identify six broad categories of emotion. "It doesn't matter to me whether I'm working with speech, cardiac or sleep signals," he says.

"They're all series of numbers. I can use a computer to design algorithms, develop models, cross-validate with physiological information and make informed decisions based on the models."

In another stream of research, Krishnan's team is developing "intelligent" hearing aids. Current hearing aids screen out environmental sounds, like those made by a loud fan or passing car, so wearers don't get a natural perspective on the world around them. "A hearing aid is basically a small computer sitting in your ear," says Krishnan. "We want that computer to have the same intelligence as a human being, so that it can decide what natural background sounds are."

Ryerson's location is ideal for Krishnan's work, making it easier to develop collaborations with neighbouring hospitals. "My research covers the full spectrum from fundamental aspects of understanding all the way to developing a prototype. Ryerson's real-world focus makes commercialization possible."

MAKING ONE AND ONE EQUAL MORE: Sri Krishnan is exploring ways to understand human physiology by analyzing numerical data from signals such as heartbeats, brain waves and voices.

Research at Ryerson.
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