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EDGE

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SEPTEMBER/OCTOBER 2015



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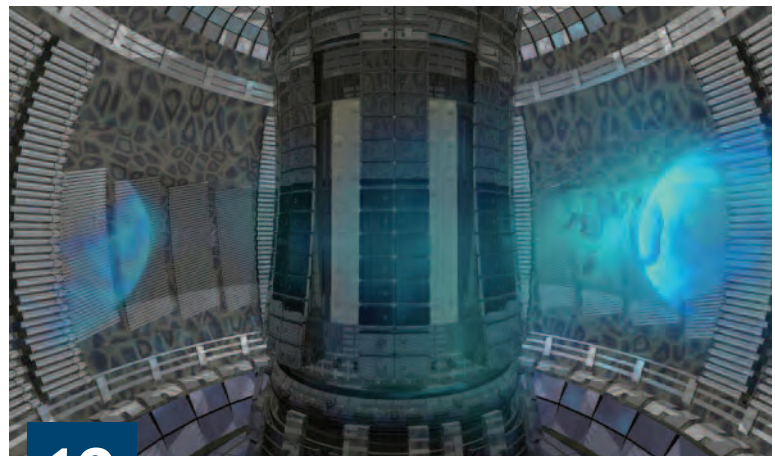
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ON THE COVER: Image courtesy of
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President's Report



APEGS President Margaret Anne Hodges, P.Eng. FEC and family at the World Science Fiction Convention

“And when man has conquered all the deeps of space, and all the mysteries of time, still he will be but beginning.”

- H.G. Wells

These were my parting high school thoughts in our graduation yearbook, while my friends were quoting the Beatles or writing coded farewell notes. The quote I wanted to be remembered for came from my grade 6 reader. Many of you can relate to how science fiction and fantasy inspired and influenced you during your formative years.

Many of you know that my husband, Edward Willett, is an award-winning science fiction and fantasy (SF&F) writer. One of my favorite stories about how SF&F has shaped the advances of our society comes from a trip we made to the World Science Fiction Convention in Reno, Nevada, a few years ago. At the end of our first night's drive we were checking in to a bed and breakfast in Glendive, Montana. Not surprisingly, we'd arrived at the same time as other travellers staying at the B&B. As we went to our room, I said to Ed, “Did you see that fellow's ball cap? It had ‘JPL’ on it! Do you think, do you think . . . ?” (Ed's less-excited response: “How should I know?”)

The next morning at breakfast, as is often customary, the travelling families exchanged their stories and reasons to be on the road. We told how we were headed to WorldCon because Ed was a professional writer of science fiction and fantasy, and that was a customary “work-cation” for us. The JPL-capped fellow exclaimed how he had always wanted to attend a WorldCon because he had been an avid reader of science fiction his entire life, noting Robert A. Heinlein and Arthur C. Clarke in particular. He was very impressed that Ed wrote SF and bought his books on the spot.

Now it was his turn. It turned out he was a semi-retired professor at the University of Tennessee and that, yes, he had worked for NASA's Jet Propulsion Laboratory. His modest claim to fame? He was the one who figured out Voyager's slingshot trajectory around Jupiter, which flung it into the outer solar system and beyond. Now it was our turn to be impressed!

Our family has just returned from the 73rd WorldCon in Spokane, Washington. We had a great time as always, attending panels not just on fiction but on science as well. At the panel on space medicine we learned that handling the physical stress of space flight has more to do with whether you are a pilot or passenger rather than other factors, including gender. On Super Science Saturday we enjoyed an entertaining presentation on evolution: changes in organisms occur much faster than one might think! But the highlight was the Carl Sagan Medal Speech given by Brother Guy Consolmagno, the Vatican astronomer. Brother Guy received the Sagan Medal in recognition of his excellence in the public communication of planetary science. His talk, “Astronomical Ideas that were Almost Correct...” illustrated how science only gets it right by first getting it wrong . . . but in the process, the human imagination evolves to interpret the data revealing our amazing universe.

We also ran into our long-time friend Robert J. Sawyer (our 2013 APEGS AGM keynote speaker) and Ed's publishers from DAW Books: DAW, as in Donald A. Wollheim, who when he was at Ace published



the first North American paperback edition of *The Lord of the Rings* and turned it into a sensation. It's a small WORLDcon after all. Now it's your turn! Please tell us about reading a science fiction or fantasy novel or short story that had an impact on your life. I promise to read all submissions, and our favourites will be published in upcoming issues of *The Professional Edge*. Send a selfie with the book cover to improve your chances! Happy reading!



ABOVE: President Hodges with author Robert J. Sawyer
LEFT: (L to R) Edward Willett, DAW Books editors Sheila Gilbert and Betsy Wollheim and President Hodges

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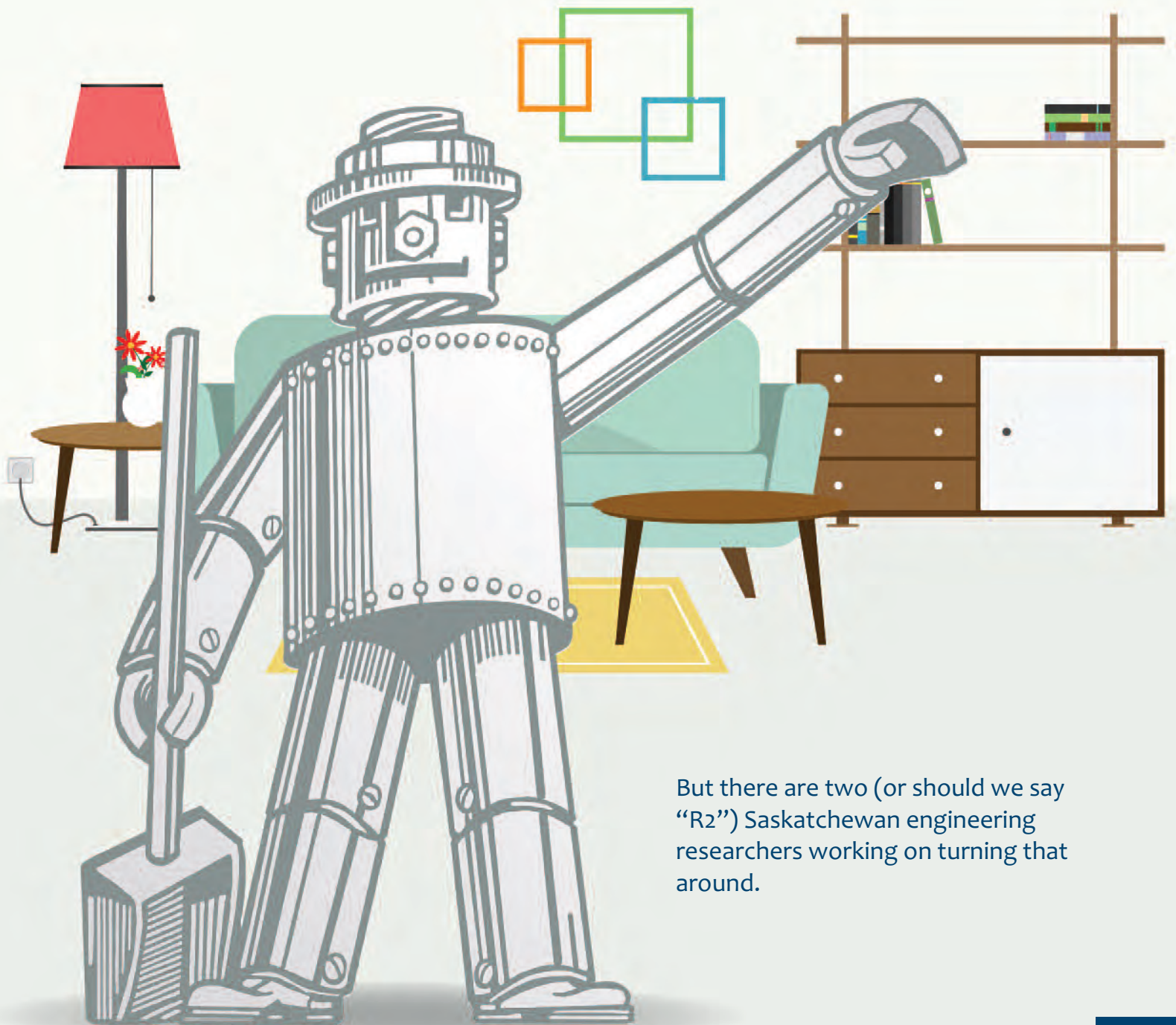
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THE MECHANICAL MEN

BY MARTIN CHARLTON COMMUNICATIONS

Anyone from the Baby Boomer generation probably feels a little ripped off by modern technology.

We were promised that, by now, robot servants would be doing all our chores for us. Instead, the most common 21st century encounter with robots is with the ones that make annoying telemarketing calls.



But there are two (or should we say “R2”) Saskatchewan engineering researchers working on turning that around.

Mehran Mehrandezh, P.Eng. from the University of Regina and Reza Fotouhi, P.Eng. from the University of Saskatchewan are developing robots that could assist humans in the fields of agriculture, petroleum and health care.



THANK GOD I'M A COUNTRY 'BOT

Fotouhi and Mehrandezh share an interest in exploring the use of robots on the farm. Although today's GPS-guided farm equipment is already nearly robot-like, the industry remains hungry for further innovation.

Fotouhi has been exploring robot farming since 2010. He sees it not only as a way to boost efficiency but also as a solution to the labour shortages and succession problems plaguing many farms.

"Who is going to be doing the farming for us in the future? The farming community in Saskatchewan is shrinking. I hope to make a class of robots that would help farmers maintain larger and larger farms."

Fotouhi envisions a future where farms are worked by teams of robots while the farmer sits in a control room instead of in a tractor.

The robot farmers could work day and night under all conditions during seeding and harvesting. They could also provide extensive environmental benefits through precision weed control.

"If you think about the way weed control is done now, with big machinery and with chemicals sprayed from an airplane, there is a lot of waste and unnecessary injection of chemicals into the environment. In the future, a robot farmer could precisely spray only on the weeds."

Mehrandezh's team is doing similar work, investigating driverless farm vehicles and precision seeding. The team was recently selected to participate in the 2016 agBOT Challenge in Rockville, Indiana.

"The agBOT Challenge is not about pitting teams against each other. It's about bringing entrepreneurial and creative solutions to modern agriculture and food production systems," said event organizer Steven Gerrish.

The teams will be responsible for full design and implementation of the hardware, software, sensors and the human-machine control interfaces that will drive their

robots. They will be challenged with planting and fertilizing a total of 12 rows, each a half mile long in an assigned set of GPS coordinates. To achieve a winning design, the teams will combine specialties such as agriculture, computer science, engineering and aviation into their agBOTS. The top team will receive \$50,000.

With the launch of the two-year competition still months away, Mehrandezh's team is still in the early stages.

"We are doing a lot of brainstorming. We plan to visit farmers to get their input on features they would like to see. We are also hoping to talk to a private company from Saskatchewan that is also competing," said Mehrandezh.

In some ways, the crop sector is playing catch-up with the dairy industry. Many of Saskatchewan's dairy farms have long since switched to robotic milking systems.



RIG PIG ROBOT

Mehrandezh is also working with west coast oil industry on using robots to do safety inspections on offshore oil rigs.

Offshore oil rigs are tethered in place by complex systems of mooring lines anchored hundreds of metres down to the seabed. Both environmental and structural stresses can cause these lines to fail over time. A failure in any of the mooring lines could be catastrophic, putting lives and the environment at risk.

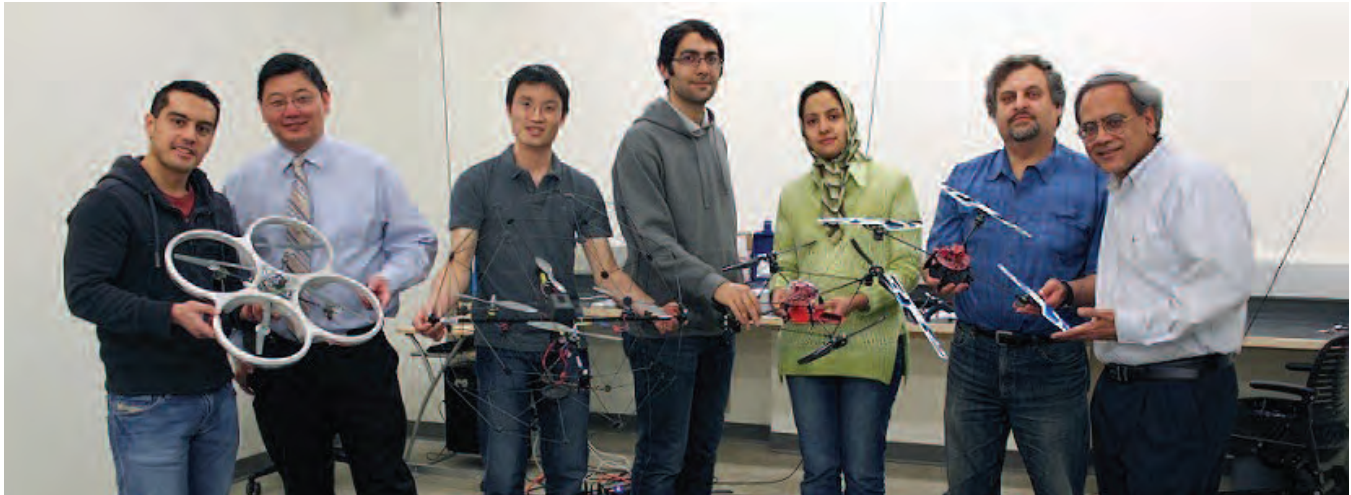
Due to the depth, humans are very limited in how they can inspect these important lines. Mehrandezh has partnered with BC-based company Inuktun to develop a robotic inspection system.

The system involves sending teams of mini-robots underwater to autonomously inspect the wires using a dual sensor system.

"We use both ultrasonic and laser systems. The former examines the structure of the internal fibres of the wires.

But the metal fatigue can also cause the wires to shrink externally so the lasers allow the robots to do a visual check of the size and shape of the wires," Mehrandezh said.

Entrants in the agBOT Challenge



Professors Mehrandezh and Paranjape with their hoverbot team

This project evolved from previous work Mehrandezh and his colleagues did for the Evraz steel mill in Regina. In that case, the robots used lasers to detect the structural integrity of pipes.

“We’ve been working with Evraz on that project for the past three years. We expect to see those robots operating here in Regina by the end of the year,” Mehrandezh said.

CANDY-STRIPER ROBOTS

Before his work in agriculture, Fotouhi had garnered worldwide media attention for his so-called “robot nurse” invention. Fotouhi envisioned using robots to alleviate labour shortages in the health care field by doing a few of the routine tasks currently done by nurses such as dispensing pills and delivering food. It could also be used in quarantine situations to help assess patients without risking the spread of infection to health care workers.

However, the title “robot nurse” might be an overstatement. “Robot candy-striper” might be more accurate given Fotouhi’s modest goals.

“We completed the navigational algorithm to guide the robot from room to room without running into things, but we still have some work to do on the arm movement. We’re focused on getting the robot capable of moving

things around, picking up a food tray and delivering it without dropping it or tipping it over. These all seem like very simple things to us but they are not simple for a robot,” Fotouhi said in a 2010 interview.

Indeed, since then much of Fotouhi’s research has focused on robotic arm and manipulator systems.

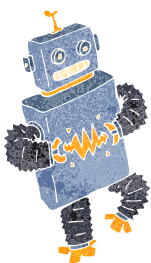
ROBOT INVASION?

Ever since the invention of mechanization, workers have been concerned about the effect of machines on jobs. As the machines have become more sophisticated, the concern has grown greater.

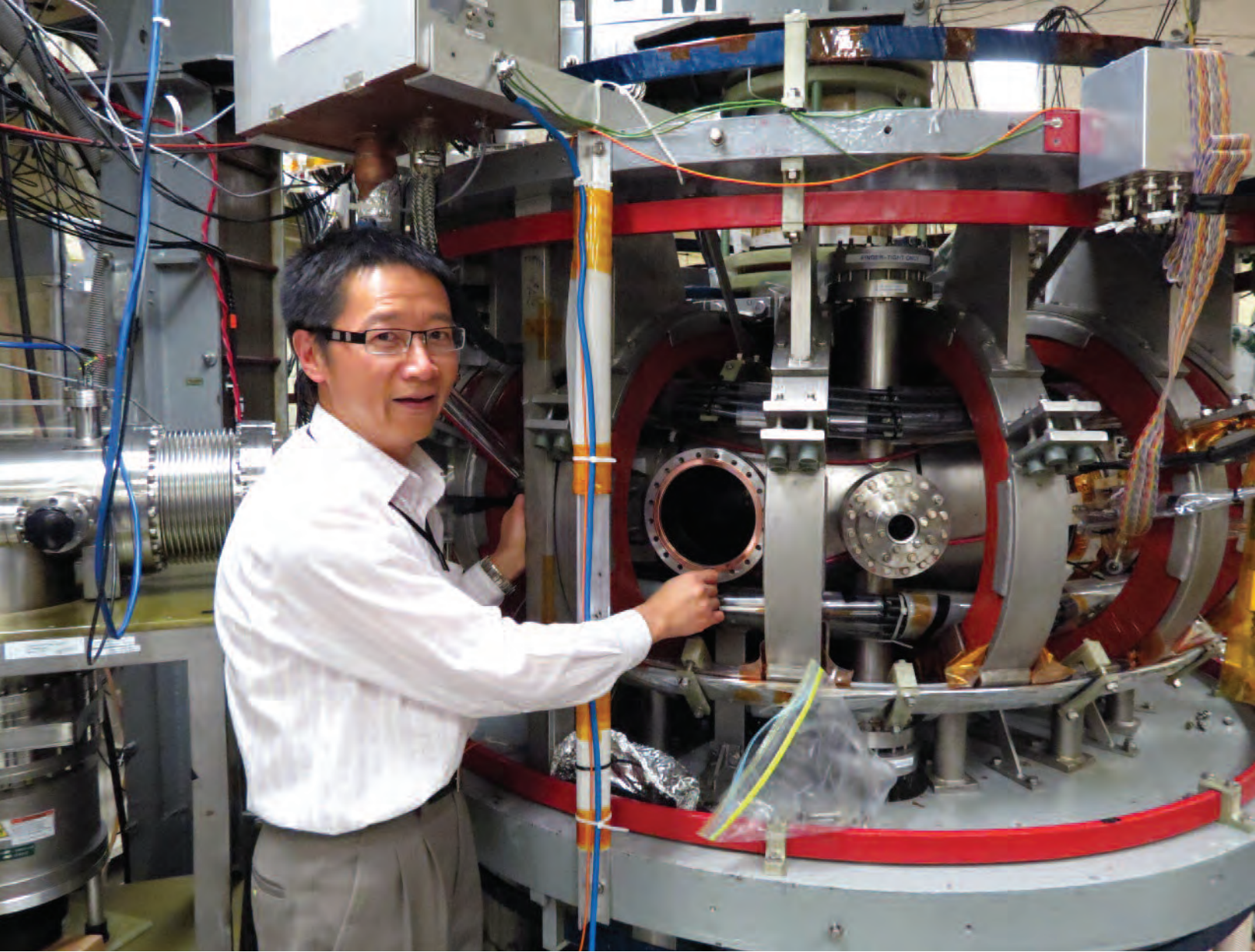
While they may be biased, Saskatchewan’s robot bosses aren’t concerned that we’ll be living in the Matrix or fighting off the Terminator any time soon.

For his part, Fotouhi doesn’t deny that robots may take some lower-skilled jobs away from humans, especially in the manufacturing sector. However, he also believes robots are useful in filling labour shortages among jobs that humans don’t want. Mehrandezh emphasized the same point.

“If there’s a risk to human life, or if the work is unpleasant or boring, then it makes sense to put a robot in and let humans do more productive things.”



“Robots are expensive and at this point they aren’t very smart, so there aren’t too many situations where it makes sense to use one. We apply what we call the ‘3-D’ standard for judging whether a robot is worthwhile. That stands for dangerous, dirty or dull,” said Mehrandezh.



Prof. Chijin with the STOR-M fusion reactor
(Photo courtesy University of Saskatchewan)

FUSION

The Other Solar Power

BY MARTIN CHARLTON COMMUNICATIONS

If you thought that the equipment in the above photo looks like the warp core from Star Trek, you're not far wrong. The elaborate mass of wires and tubes is the STOR-M tokamak experimental nuclear fusion reactor, the only one of its kind in Canada, housed at the University of Saskatchewan Plasma Physics Laboratory. Physicist and electrical engineer Akira Hirose leads a Saskatchewan team contributing to an international quest for the ultimate source of clean, unlimited power.

THE FUSION DREAM

Modern nuclear plants are powered by fission or the splitting of atoms of radioactive materials. While these plants have negligible greenhouse gas emissions, they produce highly radioactive waste materials, that must be managed. The cost and risks of large fission reactors have limited the growth of the nuclear power industry.

But the development of commercially viable fusion technology would change all of that. Its main fuel sources are effectively unlimited: deuterium which can be easily extracted from sea water and tritium which can be fabricated from lithium. In a fusion reaction, these atoms are forced together to release energy. The radiation from its waste products is much lower and much shorter lived than those produced by fission. Combined with its negligible greenhouse gas emissions, nuclear fusion holds out the promise of clean, safe, practically unlimited power for the whole planet.

“Once we have perfected this process, we will have an abundant amount of energy available to humankind for centuries to come,” said Hirose.

Fusion isn't a science fiction theory since there is a well-known natural example: the sun. Yet achieving commercially viable fusion has proven an elusive goal for scientists because so far controlling the process takes more power than it produces. The trick has been to find a way to, essentially, suspend and contain the fusion process such as by generating a magnetic force field. So far, scientists have failed to find a way to do this that doesn't consume more power than is generated. An old joke in physics circles is that “nuclear fusion is 40 years away and always will be.”

Lately, however, there has been a new hope. Billions of dollars have been invested in both public and private fusion research ventures, that seem to be getting close.

“Fusion energy research offers the tantalizing promise of clean, safe, sustainable energy. We're committed, with our partners, to developing knowledge to help address the challenge,” said Karen Chad, U of S vice-president research.

MELDING IDEAS AND ATOMS

Saskatchewan has a distinguished history of leadership in nuclear research and development, including several world firsts—most notably Sylvia Fedoruk's and Harold John's achievements in nuclear medicine. Of course, as one of the world's main sources of uranium, Saskatchewan has also made extensive contributions to the development of current fission power.

Last August, scientists from nine countries met at the U of S to conduct experiments to help answer questions crucial to developing commercial nuclear fusion.

“This series of joint experiments is an outstanding opportunity to enhance our international collaborations and provide opportunities for our students to interact with prominent world experts, while advancing fusion research,” said Chijin Xiao, professor of physics and engineering physics at the U of S.

This was not the first international venture for the U of S Plasma Physics Laboratory, whose researchers include both APEGS members and engineering students. They have sent researchers to participate in similar experiments at facilities around the world.

“This meeting showcases some of the unique nuclear capabilities at the university and is a great opportunity for Saskatchewan-based researchers to show the world what is being done in the province,” said Neil Alexander, executive director of the Sylvia Fedoruk Canadian Centre for Nuclear Innovation.

Eight experiments were part of a technical meeting sponsored by the International Atomic Energy Agency and supported by the Fedoruk Centre. Researchers used facilities at the U of S Plasma Physics Laboratory that are unique in Canada and only found in a handful of countries. These include the tokamak, a device that safely generates and stores a doughnut-shaped cloud of superheated gas or plasma.

The experiments will explore how to keep the plasma cloud stable while stoking it with hydrogen fuel and maximizing conditions for fusion to occur. The results will be used by scientists and engineers in the design of full-sized fusion reactors, such as the US\$14 billion ITER project currently under construction in France.

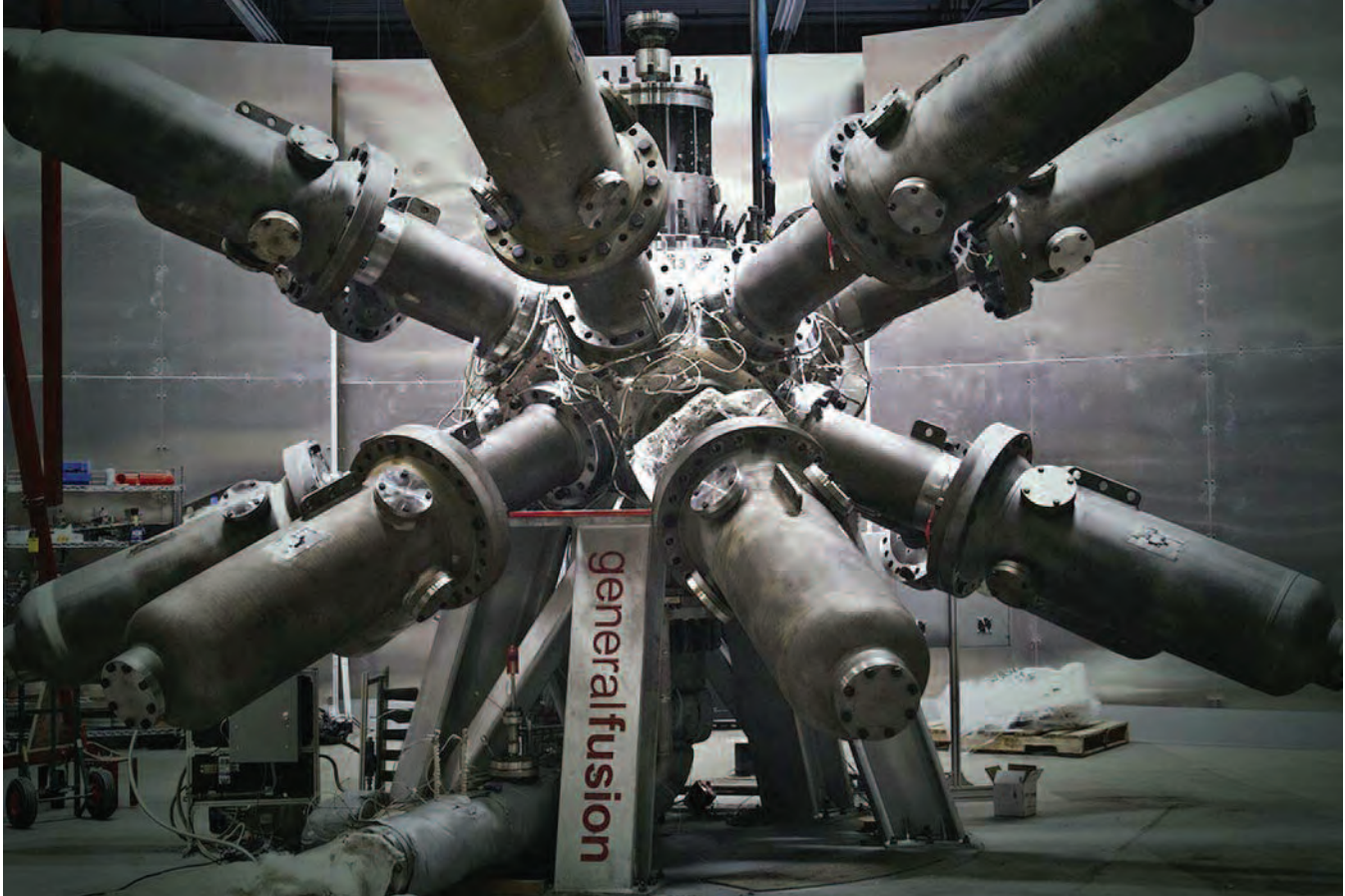
SHOW ME THE MONEY

Perhaps the most promising sign that practical fusion is near is that it has moved beyond the realm of government and academic research. Deep-pocketed business interests from around the world have sunk billions into secretive ventures claiming to be on the doorstep of fusion. A year ago, US aircraft manufacturer and military contractor Lockheed Martin made headlines promising to deliver within five years a fusion prototype that could fit on the back of a semi-truck.

Closer to home, BC-based General Fusion has the backing of a long list of venture capital funds. The company promises “the most practical and lowest-cost path to commercial fusion energy”, using a somewhat different approach than other researchers.

Hirose's team is partnering with General Fusion to help develop advanced materials for their prototype reactor.

“The University of Saskatchewan has world-class plasma physics expertise and can support General Fusion's R&D program as we work to perfect our technology,” said



General Fusion's test-scale magnetic-fusion reactor. (photo courtesy General Fusion)

Michel Laberge, chief scientist for the company.

Over the next year, General Fusion is engaging Hirose and the Plasma Physics Laboratory in the Department of Physics and Engineering Physics to test these materials. The agreement includes partial funding from the National Research Council Industry Research Assistance Program (NRC-IRAP) Business Innovation Access Program.

Hirose and his team will use their plasma diagnostic expertise to measure density, temperature and magnetic fields of the plasmas after they enter a chamber containing the material samples. The goal is to both test materials' performance and to guide development of operating procedures for the company's prototype reactor.

HURDLES AHEAD

Fans of the *Back to the Future* movies are familiar with the fantasy of fusion power: Doc Brown's futuristic car that runs on a "Mr. Fusion" engine fuelled by banana peels and waste paper. In the fantasies of some people, fusion would instantly make all other sources of power obsolete.

Skeptics of fusion, such as US based oil industry engineer Ryan Carlyle, have pointed out a number of significant limitations that would stand in the way of translating a fusion reactor into a functioning, profitable fusion power plant.

Not cheap – the sheer amount of technology, expertise and infrastructure required to operate a fusion power

plant would ensure that it could not provide dirt-cheap power as some imagine. Just because the fuel source is cheap doesn't mean the output will be; just look at hydroelectric power.

Not small – although Lockheed Martin promises nuclear fusion carried on the back of the truck, that only refers to the reactor core. A full-fledged fusion plant would require much the same infrastructure as other sorts of thermoelectric power plants, such as massive cooling towers – not something you can easily fit in the trunk of your car.

Not an instant fix for fossil fuels – it's one thing to have unlimited electric power but quite another thing to apply it to every need. Unless and until completely battery-powered cars, trucks, trains and airplanes are perfected, fusion will still represent only part of society's energy needs.

Researchers are well aware of these hurdles and are focused on overcoming them.

"What we really like about our approach is it's fairly industrial already, so when we run the math on the economics, we think we can be competitive with coal, without the greenhouse gases," said Michael Delage, General Fusion's vice president of business development.

To watch a video of Dr. Hirose from the U of S Plasma Physics Laboratory or to listen to a Ted Talk by General Fusion founder Michel Laberge, check out the electronic version of the magazine at www.apegs.ca/e-edge



MARS ATTACK



In late summer, a group of young scientists awoke at dawn, said farewell to their loved ones and prepared their Martian spacecraft for its long journey to a strange land: Poland. On August 29, 2015, the members of the University of Saskatchewan Space Design Team (USST) travelled to Krakow to participate in the European Rover Challenge (ERC).

BY MARTIN CHARLTON COMMUNICATIONS

Designing prototype Martian rovers has become a sort of nerd sport in recent years. Space agencies and technology companies around the world host fiercely competitive events that bring the winners prestige and cash prizes.

Poland is considered the home turf for international Martian rover design. Beating Poland at Martian rover design is like beating Canada at curling – nearly impossible. Polish universities dominate competitions around the world, often taking as many as five or six of the top 10 spots and routinely taking the top spot.

But not this summer. On September 7, the USST was declared the winner of ERC. This victory adds to a long shelf of trophies won by the decade-old student-led research team.

CHASING A DREAM

Robert Hewitt, an alumnus of the USST, has a long commute to work in the morning. He has to make it all the way to the future.

Hewitt's home is like any ordinary Dutch apartment but at work he handles robots, lasers, virtual reality equipment and a stage set of the Martian surface. The Canadian engineering student is a researcher working for the European Space Agency's Autonomous Robotics Laboratory. He has been preoccupied with the red planet since childhood.



“For as long as I can remember, I have dreamed of being a mission specialist on a Mars mission,” Hewitt said.

Hewitt was ecstatic to hear about the USST win in Poland. “I don’t often hear about Saskatchewan at work, so it was a nice surprise when my boss, who was one of the judges, returned from the European Rover Challenge where the USST took first place!”

Hewitt was part of the first rendition of the USST, formed in 2005. The team has changed projects over the years and was originally assembled to participate in Elevator:2010, a series of competitions leading up to the NASA centennial.

The original team designed systems for a space elevator, a concept familiar only to the most hard-core science fiction fans. The idea is to create a lower-cost way to send material into space by attaching one end of an extremely long cable to a station on Earth and the other end to an orbital station – rather like a gigantic tetherball system. Payloads could then be sent back and forth from along a sort of vertical cable car system.

The systems for the Elevator:2010 competitions were of course much smaller scale but were important proofs-of-concept. The USST proved to be world-beaters at the technology. The team placed first in 2005, 2006 and 2007, third in 2009, and set the world record for “Most Power Wirelessly Beamed” and “Fastest Power Beamed Climb.” In 2010, the team participated in the Annual Japan Space Elevator Technology and Engineering Competition where they set the record for the fastest climb with the battery-powered climber, which had greater performance than a Formula 1 race car.

NANO NANO

After the era of the space elevator, USST moved on to building a nanosatellite for the Canadian Satellite Design Challenge in 2012, where the team’s mission was to determine the total electron content of the ionosphere.

On this project, the USST faced some setbacks that prevented them from submitting an actual satellite for the competition. However, the team placed third in the critical design review.

As a part of this competition, the team designed all the components of the satellite, from the structure to the communication systems and a unique scientific payload. Its scientific payload was designed to study the total electron content of the atmosphere. The approach proposed by the USST was endorsed by a senior researcher from the United States Naval Research Laboratory.

A BIG BALLOON

At the same time that they have worked on the rover project, the USST has also worked on the High Altitude Balloon Project, known as “the HAB” among team members. The balloon holds 3 cubic metres of hydrogen gas and carries an electronic payload weighing approximately 2 kilograms used to collect images, video and environmental data, and to serve as a platform for scientific experiments. It includes multiple GPS trackers, along with both analog and digital radios to enable constant communication with teams on the ground.

The USST High Altitude Balloon program is a collaborative project with the Saskatoon Amateur Radio Club SABRE group.

OFF TO POLAND

For the past two years, the USST’s main focus has been on rover design competitions. During the preliminary design stages, the team was divided into two groups, one for the mechanical subsystems (chassis and mobility) and one for the electrical subsystems (controls, power, communications, and software). Members of each of these groups



UNIVERSITY MARS ROVER COMPETITION PARAMETERS

The international Mars Society sets out extensive technical parameters for participants in university rover challenges. In brief, the requirements are:

- Completely independent platform (on-board power, wireless communication, etc)
- Maximum rover mass: 50 kg
- Must return sufficient information for teleoperation
- Must be capable of traversing up to a 15 degree slope
- All components must use processes suitable for Martian operation
- Communication methods must comply with all Federal Communication Commission requirements
- 900MHz communications are limited to one of three 8MHz subbands
- Communications range of at least 1 km
- The rover must be able to provide its location using GPS
- Operate for up to an hour without charging
- System must cost less than \$15,000 US

independently explored options for the subsystems. (See sidebar “University Mars Rover Competition Parameters.”)

At the University Rover Challenge hosted by the Mars Society in Hanksville, Utah, the team placed a respectable sixth in 2014 and seventh in 2015. Considering the desert environment of the competition, the Saskatchewan team was almost literally eating the dust of the Polish and American teams.

After the Utah event in June, the team redoubled its efforts to refine its design in time for the ERC, held just a few months later.

The team endured a gruelling 16 hours of travel to get to Krakow, Poland and then spent another day recovering from jet lag. When they finally got their feet on the ground, they confronted a potentially disastrous mishap. Like a scene out of Apollo 13, they discovered that their Martian spacecraft had flown off course and landed in Warsaw.

Austin Shirley, the club’s VP of Engineering, drove a gigantic rental van up to Warsaw to retrieve the wayward craft.

“The guard at the warehouse didn’t speak anything other than Polish, so it took a lot of phone calls and exasperated sighs to get into the compound. Once inside, we found ourselves trying (largely unsuccessfully) to communicate using a broken mess of English, Polish, Ukrainian and German. We did finally get the rover into the van and back to the hotel,” said Shirley.

The delays meant the team had to scramble at the last minute to get the rover tuned up for competition.

“I spent four hours walking all over town looking for a power inverter, amongst other things,” said club president Jack Fotheringham.

The team members stayed up until 4:30 a.m. finishing repairs and refinements, only to wake up at 5:30 a.m. to head down to the competition grounds.

For the next two days, the rover was put through its paces with a variety of tasks that simulated a Mars mission, including terrain traversal, astronaut assistance, equipment maintenance and sample collection.

At the end of the second day, all the competitors gathered to hear the results.

“After hearing that McGill from Quebec and #Next from Poland had placed third and second respectively, we figured that we must have lost to both of them. It was absolutely unbelievable when they announced that we had taken first place!” said Shirley.

There followed lots of interviews, photos and general excitement. The team came home with \$1000 US, a voucher for an online robotics store and three Edison computers.

THE STARS MY DESTINATION

Hewitt is not the only USST alumnus to graduate to professional space research. According to Fotheringham there is a growing list of them.

“The team provides a way for students to implement technology skills and conduct practical problem solving in ways that aren’t always available in academia. That obviously makes them more attractive to employers, especially when those employers are space agencies and related companies.”

To see video of the USST rover in action, check out the electronic version of the magazine at www.apegs.ca/e-edge

Member Profile



This month *The Professional Edge* chats with Prof. Duncan Cree, P.Eng., a mechanical engineer teaching at the University of Saskatchewan.

Tell us about your personal and professional background.

I was born and raised in Kanesatake, a small reserve near Oka, Quebec. You might have heard of it. In the Quebec CEGEP system, I took aircraft maintenance at John Abbot College. After that, I enrolled in Concordia University in Montreal to study mechanical engineering. I ended up getting all three of my degrees, all the way up to Ph.D., at Concordia.

Why did you choose to go into engineering?

It wasn't my first choice. Originally I wanted to be a car mechanic like my dad. A high school teacher had a talk with me and urged me to go to college since I had good grades. Also, I have an uncle who is a medical doctor who has given me a lot of advice over the years. He asked me, "Why would you want to fasten bolts all your life when you can be the guy who tells people where to fasten the bolts?"

What was your biggest challenge in college?

It was my first time away from home. We lived in the country so adjusting to the big city was very intimidating. I also found it difficult to make friends. The Oka crisis had happened just a few years before. Many people were still mad about it so I think they were reluctant to talk to me once they learned where I was from. Of course, this can be quite a handicap – in engineering you need friends to help you study and keep up your grades. Eventually I just stopped telling people where I was from.

What was your first job after college?

In between my bachelor's and master's degrees, I worked with the National Research Council of Canada with the Flight Research Laboratory in Ottawa. My official title was "Airworthiness Engineer in Training." Basically I was a tire kicker to make sure things were safe. If any changes had been made to the aircraft, it had to undergo rigorous testing and stress analysis before being put back in the air.

Throughout college I also had summer jobs at various places such as Pratt & Whitney and at Bombardier Aerospace where I helped repair CF-18s. That was pretty cool but of course it was also a very secure environment. I wasn't allowed to touch the aircraft unless there was a security guard watching me.

After I obtained my Ph.D., I did post-doctoral work at Queen's University and signed a three-year contract there in the civil engineering department. I've been here at the U of S for about a year.

Finish this sentence: "If I wasn't an engineer, I'd probably be a ..."

... A car mechanic like my dad.

What are your pet peeves?

There aren't enough hours in the day to do everything I want to do.

If I could have only one condiment in the house, what would it be?

Ketchup. I put it on pretty much everything.

What do you feel was your single greatest accomplishment as an engineer?

Earning my Ph.D. I enjoy teaching new courses and mentoring the new upcoming generation of engineers.

Speaking of mentoring, what advice do you have for other Aboriginal students thinking about going into engineering?

I would say that acquiring engineering skills would allow them to

help their communities in many ways, such as solving water issues and helping overcome housing and even social problems. Whatever path they choose, I would advise students to stay in school, work hard and never give up on their dreams.

What are your interests outside of work?

I volunteer at Aboriginal high school science fairs. I served as a judge for them for 10 years back in Quebec and just did one here in Saskatoon recently. I feel it is a way to give back to the community. I also like travelling. I enjoy encountering different people and cultures.

What's your favourite travel spot?

Paris. I've been there many times.

Have you ever met anyone famous?

Quite a few, actually. In 2007, I attended a program at the International Space University where I met Canadian

astronaut Robert Thirsk and US astronaut Jeffrey Hoffman who repaired the Hubble Telescope. At a conference at Rideau Hall, I met then-Governor-General Michaëlle Jean. I once won an Aboriginal educational award which was present to me by former child star Emmanuel Lewis and members of the Trailer Park Boys. I also once met Fred Sasakamoose, first Canadian Aboriginal NHL player, who played for the Chicago Blackhawks.

Who has had the greatest influence on your life and career?

Of course, my parents have had the greatest influence over my life. My dad, in particular, drove the work ethic into us. We always had chores to do around the house that kept us out of trouble. The chores also helped me decide I didn't want to go into manual labour for a living.

As for my career, I would once again have to say my uncle, the doctor, who has pushed me and guided me throughout my career.

Welcome to the Future ... of *The Professional Edge*

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ProfessionalEdge

 Association of Professional Engineers and Geoscientists of Saskatchewan



In this issue of the *The Professional Edge*, we are pleased to announce the launch of our digital edition pilot project which you can view online at www.apegs.ca/e-edge

Many publications have online PDFs or flipbook-style virtual magazines that are suited for reading on desktop computers. We have moved beyond those formats and established a mobile-friendly multimedia version of the magazine.

The web version is scalable so you will see appropriate versions on your tablet or smart phone. In addition to being able to read all the usual written material on the go, you will also be able to access multimedia content that complements the articles.

The first digital edition is an experiment. After this, we will take time to refine the online product to suit the needs of our readers.

What do you think? If you have comments or suggestions about the digital edition, please send them to apegs@apegs.ca

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Letter to the Editor

Upon reading the “Seven Engineering and Geosciences Wonders of Saskatchewan” article in the July/August 2015 issue of the Professional Edge, it was noted by several members here at the Water Security Agency that there are a number of pieces of misinformation in the section discussing the major dams in the province, particularly the discussion on the 2011 flood event in the Souris River Basin. The following provides a brief summary of the 2011 events which unfolded in the Souris River Basin and how the system was operated:

In the spring of 2011, an estimated 1:100 year snowmelt runoff event brought Rafferty Reservoir to its Maximum Allowable Flood Level (MAFL) in early May. This was followed by a series of moderate rainfall events during the month of May and into the first part of June which held the reservoir near MAFL. The structure’s spillway was operated to convey flood flows for the first time in the structure’s history throughout this period. On June 16-18, a severe rainfall event over a saturated basin resulted in a massive inflow to the reservoir. Although difficult to estimate the frequency of this event, it is believed to have a return period of approximately 500 years. Faced with the possibility of another rainfall event, the spillway gates were opened fully on June 20 to prevent a surcharge above the MAFL. Outflows remained high until into August when the reservoir returned to its normal full supply level on August 5. Throughout the event the system was operated according to the 1989 Canada-US Agreement on Water Supply and Flood Control in the Souris River Basin. While downstream flooding was significant, particularly in Minot ND, all flood peaks in the US were attenuated through the operation of the Rafferty and Alameda Project. While the events brought Rafferty to its MAFL and required that the spillway gates be opened fully, the design limitations of the structure were not exceeded.

Curtis Hallborg, P.Eng.
Manager, Flow Forecasting & Operations Planning
Water Security Agency (WSA), Moose Jaw, SK

The editorial staff of the **Professional Edge** would like to extend our apologies to WSA and our readers for the inaccuracies and would like to thank WSA for these clarifications.



APEGS Director of Education and Compliance

Shawna L. Argue, MBA, P.Eng., FEC, FCSSE, FGC(Hon)

Dennis Paddock, P.Eng., Executive Director and Registrar of APEGS, is pleased to announce the appointment of Shawna L. Argue, MBA, P.Eng., FEC, FCSSE, FGC(Hon), as Director of Education and Compliance.

Shawna graduated from the University of Regina in 1987 with a Bachelor of Applied Science in Industrial Systems Engineering (Cooperative Work Studies Designation). She obtained her MBA from Athabasca University in 1999.

Shawna has been a practising consultant in Saskatchewan since 1988, primarily in the environment, health and safety (EHS) field. She has worked in a variety of countries around the world and for a variety of industrial clients. Her areas of practice focused on EHS compliance auditing and EHS management system consulting and auditing. She was one of the first of 60 EHS auditing professionals to receive her Certified Environmental Auditor designation and later her Environmental Management System Lead Auditor designation. Having worked for a variety of international consulting companies, she started her own company in 2004 and has enjoyed continued success as a consultant.

Shawna has been an active APEGS volunteer throughout her career, having served on several APEGS committees and ultimately being elected to APEGS Council in 2004 as the first Group VII (Environment) Councillor. She was subsequently elected as vice-president and served as APEGS president (2010-2011). Since her time on Council, Shawna has served as Chair of the Awards Committee, as APEGS’ delegate to PNWER and on multiple task forces. Shawna has also been on the ACEC-SK board of directors and is currently a director-at-large and member of the Honours and Awards Committee for the Canadian Society of Senior Engineers. She was recently appointed as an Alternate Warden for Kipling Camp 25.

Shawna has received recognition for her professional and volunteer activities from the Regina Engineering Society (Technical Excellence, 2003 and Volunteer Service, 2012-2013), Engineers Canada (Fellow 2009), Canadian Society of Senior Engineers (Fellow 2013), Geoscientists Canada (Honourary Fellow 2013) and was the recipient of the YWCA Women of Distinction for Science, Technology and the Environment, 2000.

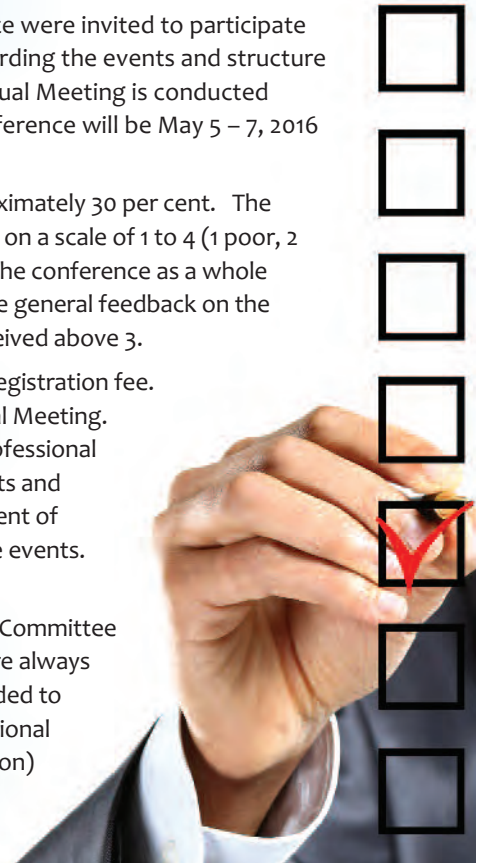
Annual Meeting Survey 2015

APEGS members who attended the 2015 APEGS Annual Meeting and Conference were invited to participate in an online Annual Meeting survey. The survey consisted of six questions regarding the events and structure of the Annual Meeting held in Regina April 30 – May 2nd, 2015. The APEGS Annual Meeting is conducted every year during the first weekend in May. The 2016 Annual Meeting and Conference will be May 5 – 7, 2016 at the Delta Bessborough in Saskatoon.

Over 100 members completed the survey, representing a response rate of approximately 30 per cent. The respondents in attendance at the Annual Meeting were asked to rate each event on a scale of 1 to 4 (1 poor, 2 fair, 3 good and 4 excellent). All events were rated higher than a 3 on average. The conference as a whole received a rating of 3.68. Respondents were provided the opportunity to provide general feedback on the Association's Annual Meeting. APEGS staff and the conference facilities also received above 3.

Respondents were asked to indicate for what events they were willing to pay a registration fee. Registration fees would help offset the costs APEGS incurs to conduct the Annual Meeting. Approximately 23 per cent indicated they would pay a registration fee for the professional development sessions. Almost 40 per cent were willing to pay to attend banquets and approximately 25 per cent would be willing to pay for luncheons. About 25 per cent of respondents indicated they would pay an overall registration fee to attend all the events. Just over 33 per cent indicated they are not willing to pay any fees.

The Connection and Involvement Committee and the Professional Development Committee thank you for participating in the survey. Additional comments or suggestions are always welcome and encouraged on an ongoing basis. General feedback can be forwarded to Chris Wimmer, P.Eng., FEC cwimmer@apegs.ca. Feedback regarding the professional development day can be forwarded to Shawna Argue, P.Eng., FEC, FCSSE, FGC(Hon) sargue@apegs.ca. All feedback will be provided in confidence to the appropriate planning group.



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Professional Development Days

Continuing Professional Development Workshop



centennialfoodservice.com

Integrating Climate Risk into Infrastructure Development

Willows Golf & Country Club, 382 Cartwright Street, Saskatoon SK
November 5, 2015, 8:15 am to 5:00 pm

This one-day introductory workshop will provide participants with information about, and practice with, a practical tool and process that systematically assesses the risks of current and future climate on public infrastructure, with a focus on building and water infrastructure.

Between 2007 and 2012, Engineers Canada, in partnership with Natural Resources Canada, developed the PIEVC Engineering protocol. The protocol is a structured procedure using standard risk assessment science to assess and fully document the vulnerability of infrastructure to the impacts of current and future climate at a screening level.

Two facilitated group sessions will demonstrate the steps in the Protocol through hands-on, small-group exercises to define the infrastructure components and climate parameters and to undertake a qualitative, screening-level risk assessment using completed case studies of building and water infrastructure to illustrate real life applications.

This workshop will be of interest to those professionals who are involved in policy, planning, pre-design, design, operation, maintenance, management and regulation of building infrastructure and who, now and in the future, need to consider the changing climate for these activities.

Upon completion of the workshop, participants should:

- ✿ Understand the increasing costs and liabilities related to public infrastructure as a result of climate change
- ✿ Understand historical climate trends and methods for climate projection in Saskatchewan as these pertain to infrastructure
- ✿ Have a basic understanding of risk assessment as applied to infrastructure response to changing climate
- ✿ Have hands-on experience with the application of climate change risk assessment for selected infrastructure examples
- ✿ Recognize the benefits of a multi-disciplinary and multi-stakeholder team to address the impacts and complexities of climate change on infrastructure

The workshop will include a morning coffee break and lunch. Coffee will be available throughout the afternoon sessions. Copies of presentation materials will be provided.

For more information, visit the APEGS website at www.apegs.ca

Registration

November 5

PIEVC

\$450 + GST per person.

Early bird to October 16, 2015
\$400 + GST

Breakfast, lunch and coffee breaks provided.

November 6

RGI & Martin Charlton Media Training

\$350 + GST.

Early bird to October 16, 2015
\$300 + GST

Breakfast, lunch and coffee breaks provided.

Contact Shawna Argue at the APEGS Office for additional information.

sargue@apegs.ca

306.525.9547 or

1.800.500.9547
(Outside Regina)

Register online at
www.apegsservices.ca/meetings

Professional Development Days

APEGS Continuing Professional Excellence Sessions, November 5-6, Saskatoon



November 5, 2015

Volunteer Appreciation Reception

The APEGS Connection and Involvement and Professional Development Committees are pleased to present the Volunteer Appreciation Reception to be held in the evening at the Willows Golf & Country Club in Saskatoon (382 Cartwright Street, Willows Subdivision) on November 5, 2015 following the PIEVC Workshop.

All APEGS volunteers and fall PD registrants are invited to attend this event to enjoy food, drink and networking opportunities. Entertainment will also be provided throughout the evening. There is no cost to attend this event.



November 6, 2015

Ethics and Technology

Speaker: Lisa Moretto, President, RGI Learning, Inc.

Respect, integrity, honesty. These are characteristics that all firms strive for. Too often organizations overlook the importance that ethical behaviour plays in a well-run business. But these behaviours must be instilled at all levels, not just the management level.

Every day, engineers and geoscientists are confronted with decisions that may challenge their values: An inaccurate formula, a dirty test sample, a rushed calculation.

This session helps show how logic, reasoning and language act as tools for sound decisions. Rather than reciting laws and loopholes that keep you out of trouble, we teach concepts that will help you and your organization be recognized as fair and reasonable decision makers.

RGI is a certified professional development course provider for the New York State engineering community.

We will review the APEGS Code of Ethics and make participants aware of what it is and how it affects them.

November 6, 2015

Handling the Media 101

Speaker: Martin Charlton Communications

This is a practical step-by-step guide to media interviews, covering:

- ✦ Preparation
- ✦ Understanding the media
- ✦ Why “no comment” doesn’t work
- ✦ Bridging to your message
- ✦ Preparing key points
- ✦ Understanding the “sound bite”
- ✦ Predicting questions
- ✦ Choosing your words
- ✦ Effective media delivery



November 6, 2015

Presentation Training

Speaker: Martin Charlton Communications

Join us to learn tips, techniques and practical suggestions for giving effective presentations.

We will cover the essentials of preparing, designing and delivering presentations such as:

- ✦ **Planning:** Creating an outline that considers audience and key messages.
- ✦ **Preparation:** Building content including text, imagery, video, audio, practical demonstrations and audience interaction.
- ✦ **Delivery:** Using notes, cue cards, PowerPoint, and knowing the difference between presentation notes and PowerPoint.
- ✦ **Practice:** Tips and techniques to ensure each presentation element works and that your time is accurate.
- ✦ **Presentation Skills:** The practical elements such as attire, body language, tone of voice, words and volume.
- ✦ **Presenting:** Using equipment, pace and delivery.

To register or for more information, visit the APEGS website at www.apegs.ca

Call for Award Nominations

The Awards Committee is seeking nominations for the APEGS Awards as well as other provincial and national awards such as the Saskatchewan Order of Merit, the Order of Canada, the Canadian Engineers' Awards (Engineers Canada) and the Canadian Professional Geoscientist Award (Geoscientists Canada).

If you know of a Professional Engineer or Professional Geoscientist who should be considered for an award, or an exceptional engineering or geoscience project that should receive an award, the committee would like you to nominate that member or project. There are seven APEGS awards: the Exceptional Engineering/Geoscience Project Award, the Environmental Excellence Award, the Friend of the Professions Service Award, the Promising Member Award, the McCannel Award, the Brian Eckel Distinguished Service Award, and the Outstanding Achievement Award. Criteria for each of the awards are contained in the nomination form that appears on the next page.

In addition to the APEGS Awards, the Awards Committee nominates APEGS members for awards presented by both Engineers Canada and Geoscientists Canada. Nominations for awards must be received by November 30 to provide time for the Awards Committee to review and consider the nominations for the annual APEGS Awards and to prepare nomination packages for provincial and national awards. The Awards Committee will develop and maintain a list of nominees for consideration for the various awards.

Nomination form on following page.

Please send nominations to:
APEGS Awards Committee
300 - 4581 Parliament Avenue
Regina SK S4W 0G3
Fax: (306) 525-0851
Email: apegs@apegs.ca



Nominations for APEGS Awards

Do you know an individual or a group who should be considered for an award?

I would like to nominate:

In the following category:

Exceptional Engineering/Geoscience Project Award

Accomplishments in Engineering/Geoscience (100%). The project team must be made up predominantly of Saskatchewan engineers and/or geoscientists. The project may be located inside or outside of Saskatchewan. The award will be granted when the efforts of an individual or team of engineers/geoscientists is deemed to be of great significance.

Environmental Excellence Award *(all professional members of APEGS are eligible)*

Environmental awareness, preservation, protection and reclamation through education, leadership and/or involvement (25%). Enhancement of quality of life by improvement of the physical or social environment through engineering, geoscience or other works (10%). A real extent of environmental protection or preservation as a result of the efforts (50%). Prevention of potential environmental impacts vs. correction/remediation of existing impacts (15%). This award is intended to have broad scope and be open to a wide range of projects, achievements, initiatives and activities contributing to the protection and preservation of the environment.

Friend of the Professions Service Award *(available to anyone who is not a member of APEGS)*

Recognizes contributions by an individual or a group in the support and promotion of the professions (100%). Examples of activities include: documentation of the history of the professions; comprehensive media coverage of an outstanding engineering or geoscience achievement; long-time service on an APEGS committee or other form of contribution to the success of activities promoting the professions to the public.

Promising Member Award *(available to any member who has held P.Eng./P.Geo. for less than 5 years)*

Accomplishments in Engineering/Geoscience (50%). Service to the professions in public education and/or active participation in engineering/geoscience associations, societies, institutes (25%). Service to community (25%).

McCannel Award

Accomplishments in Engineering/Geoscience (20%). Service to the professions in public education and/or active participation in engineering/geoscience associations, societies, institutes (70%). Service to community (10%).

Brian Eckel Distinguished Service Award

Accomplishments in Engineering/Geoscience (35%). Service to the professions in public education and/or active participation in engineering/geoscience associations, societies, institutes (35%). Service to community (30%).

Outstanding Achievement Award

Accomplishments in Engineering/Geoscience (70%). Service to the professions in public education and/or active participation in engineering/geoscience associations, societies, institutes (20%). Service to community (10%).

I am nominating this person / project because (25 words or less):

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Other references (professional and community service related) to contact include:

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Submitted by:

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Call For Council Nominations

Nominating Committee

The Nominating Committee, chaired by Past President Andrew Loken, P.Eng., FEC, is soliciting names for the positions described below. You may contact staff support to the Nominating Committee, Bob McDonald, at rhmcdonald@apegs.ca to propose the names of potential candidates. Bob may also be reached through the APEGS office in Regina by phone at 306 525-9547 (toll free 1-800-500-9547 North America), or facsimile 306 525-0851.

The Bylaws require the Nominating Committee to nominate, whenever possible, for President the person holding the office of President-Elect, and one person for the position of President-Elect (typically the person holding the office of Vice-President). Tara Zrymiak, P.Eng., FEC is the current President-Elect and Ernie Barber, P.Eng. is the current Vice-President. The Nominating Committee is also required to nominate, whenever possible, at least two persons for Vice-President and at least two persons for each vacancy on the Council.

Submission of Nominations

Any five members may nominate over their signatures an eligible nominee for any elective office, except that of President. Such nominations shall be in the hands of the Registrar at least forty-five days before the election is to take place. To meet this requirement, the nominations must be in the APEGS office no later than 5 p.m., Thursday March 17, 2016, as the election will take place when ballots are counted on Monday May 2, 2016, the “polling day.”

2016 Vacancies & Terms of Office

Officers

- President-Elect – one-year term
- Vice-President – one-year term

Group and Electoral District Councillors - to serve three-year term

- Group I (Civil)
- Group III (Electrical and Engineering Physics)
- Group IV (Geological, Mining, Petroleum, Geophysics and Geoscientists)
- Group VII (Environmental)

Eligibility for Nomination

- Only members in good standing are eligible for nomination. A person elected to Council may only hold office while a resident of Saskatchewan.
- A person nominated for President-Elect must have served at least one full year (i.e. from the close of business at one annual meeting to the close of business at the next annual meeting) as a member of APEGS Council prior to the date on which they would assume office as President-Elect.
- A person who is nominated as a representative of an electoral group must be classified with the association in that electoral group. The Councillor representing Members-in-Training can complete the term of office after obtaining his or her P.Eng. or P.Geo. status.



Fees for 2016 are due on or before December 31, 2015

Renewal notices will be mailed soon!

Renewal notices will be sent mid-November and it is the responsibility of members and the official representative for a Certificate of Authorization to make sure contact information is up to date, including your email address.

To check your contact information, log into your On-Line Profile by clicking “Login” in the top right corner on the APEGS home page. If you have never used the system before, click on “New password / Forgot password” and follow the instructions.

Check your contact information in your On-Line Profile

If you don't receive your dues notice by December 1, 2015, contact APEGS. Fees are due on or before December 31, 2015 regardless of problems with delivery.

Other things that can be done in your On-Line Profile are: all other fee payments, entering Continuing Professional Excellence (CPE) credits, renewing Permission to Consult, managing your email/mail subscriptions and volunteering for APEGS.

What happens if I don't renew?

You would no longer have the privilege of practicing within Saskatchewan or on properties or facilities located in Saskatchewan. Use of title in Saskatchewan is also a privilege of membership.

Members who do not retain their membership in APEGS and/or another Canadian association/ordre will lose coverage under the National Secondary Professional Liability Insurance Program. Also, failure to maintain your membership will result in ineligibility for benefits under the group life insurance program offered through Manulife and Engineers Canada if you have subscribed to this insurance.

What if I am not working in Saskatchewan?

Members who are retired or not working (at anything) in Saskatchewan can retain membership and may be eligible for a waiver of the fees for the annual licence. More information can be obtained from the documentation accompanying the dues notice or from the APEGS office.

What if my membership ceases and I need to reinstate?

Memberships that have ceased are subject to a 15 per cent fee to reinstate in the same calendar year. Members who notify the APEGS office in writing of their intent to resign their membership on or before January 31, 2016 may reinstate their membership and licence during the calendar year without the payment of a reinstatement or application fee. The late payment penalty for the holder of a Certificate of Authorization is 15 per cent of the annual fee.

For reinstatement procedures for subsequent calendar years, see the APEGS website under Apply, Reinstatement.

Eligibility for Life Membership

Members who are 65 years of age and retired are eligible to apply for Life Membership. An application will come with your renewal notice in mid-November.

News Beyond Our Borders



Montreal's SmartHalo turns any bike into a smartbike

PLANT magazine - A Canadian technology company has developed an attachment that will instantly make your bicycle "smart."

The SmartHalo, which at first look is more hockey puck-like than super-powered "connected" device, attaches to the handlebars of any normal bike and pairs with your smartphone to act as a visual navigation guide, complete with turn-by-turn signalling.

The idea is meant to keep cyclists' eyes on the road and off their phone or smart watch when navigating around town.

Along the route, SmartHalo will provide a simple green lighting prompt to tell you when you need to turn. The device also connects with the app to provide biking statistics, including distance travelled, average speed and calories burned. It allows you to check up on your bike if you've locked it up somewhere, and it's weather resistant. An alarm is included in case someone tries to rip the device off your bike.

Device issues commands through bones

Institute of Mechanical Engineers - BAE Systems has developed a device that transmits sound through bones, enabling soldiers to maintain communication and situational awareness on the battlefield while still wearing ear protectors.

The transponder, which is the size of a nickel and is built into a helmet, has been designed to improve soldier safety. It uses the body's natural ability to transmit sound through bone conduction to transfer messages from the soldier's helmet to the inner ear through cranial bones directly to the cochlea.

Soldiers, obviously, need to be able to receive and hear field commands but also need protection from extremely loud noises such as gunfire.

To address these conflicting requirements, BAE Systems engineers adapted existing bone conduction technology used in commercial headphones and hearing aids for the military.

I'll drink to that

Institute of Mechanical Engineers - Lower operating costs and reduced carbon emissions are worth celebrating if you're running a whisky distillery.

Scotland has a proud heritage of whisky making that can be traced back as far as the 13th century. But with the industry facing the very modern concerns of energy efficiency and the reduction of carbon emissions, it is now having to consider overhauling its processes and rethinking the use of some traditional technologies.

One of the most energy-intensive elements of the process is heating thousands of litres of water at a time. Many distilleries power these processes using environmentally unfriendly heavy-fuel-oil boilers. A typical medium-sized distillery is liable to use 1-3 million litres of heavy fuel oil a year. That adds up to a significant carbon footprint.

The Scotch Whisky Association has set industry-wide targets with the aim that by 2020, 20 per cent of energy requirements will be derived from non-fossil fuels, rising to 80 per cent by 2050. But is an industry so steeped in history and tradition willing to adopt modern energy-saving technologies?

There is something of a green revolution occurring across a number of Scotland's distilleries. The projects will finance the installation of biomass boilers to replace the existing heavy fuel oil plant. Two distilleries, Tomatin and Aberfeldy, have come on board, with five more set to install green biomass boilers in 2015.

Sensors stop drivers from dozing off

Institute of Mechanical Engineers - A German engineering company has developed sensor technology that prevents drivers from falling asleep while behind the wheel.

Sensofoil, from Hoffmann + Krippner, consists of sensors within the steering wheel that can detect minute changes in the pressure and positioning of the driver's hands. In response to such changes, an alert such as a seat vibration or sound is triggered to restore concentration or prompt the driver to pull over and rest.

Traffic experts claim that 25 per cent of all road accidents are caused by extreme fatigue. Hoffmann + Krippner said the technology could react to a change in pressure within 200 milliseconds, quick enough to prevent drivers from taking "micro-sleeps," a leading cause of accidents.

Similar efforts to address driver fatigue are already in advanced stages of development. Many manufacturers have been using eye-tracking and virtual reality to improve safety in cars, and earlier this year Jaguar Land Rover developed an innovative 3-D instrument cluster which uses the latest head- and eye-tracking technology to create a natural-looking 3-D image on the instrument panel.

Mercedes-Benz has also been researching the analysis of brainwave patterns to identify drowsiness and inattentiveness in drivers.

U of A researchers strive to bring hydrogen vehicles to market

Association of Professional Engineers and Geoscientists of Alberta - As countries around the world struggle to reduce carbon emissions, the race is on to find greener transportation options. Engineering researchers at the University of Alberta want to see hydrogen vehicles make it to the finish line.



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SASKATOON OFFICE OPENING

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Adam Gmeinwieser, P.Eng. has been appointed as the Saskatoon Office Manager. Mr. Gmeinwieser is a senior geotechnical engineer who completed his Bachelor of Science in Engineering at the University of Saskatchewan in 2002 and has been with the firm since 2012. He has completed projects in the areas of foundation engineering, slope stability and transportation in Saskatchewan, Alberta and the Northwest Territories.

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Contact: Adam Gmeinwieser, P.Eng.
Phone: (306) 974-9440, Fax: (306) 974-9443
Email: saskatoon-manager@thurber.ca



Hydrogen fuel-cell technology isn't new – but it's been too costly to bring to market. Dr. Marc Secanell Gallart, P.Eng., who directs the university's Energy Systems Design Laboratory, is finding ways to lower costs by reducing the amount of platinum needed.

This rare and expensive metal acts as a catalyst in the chemical reaction that creates electricity from hydrogen. He's been collaborating with Mercedes Benz and Ford, which have both used his research to release hydrogen vehicles on a small scale. The companies plan to expand their offerings in the next couple of years as hydrogen fill-up stations become more common. Hydrogen vehicles run five-times longer than battery-pack electric cars and are refuelled quicker – in just a few minutes, rather than the 30 minutes to several hours needed to charge electric cars.

Robots capable of natural selection

Institute of Mechanical Engineers -

Researchers have observed the process of evolution by natural selection at work in robots, by constructing a mother robot that can design, build and test its own children. It can then use the results to improve the performance of the next generation without relying on computer simulation or human intervention.

The University of Cambridge team only provided one initial command to build a robot capable of movement. The mother proceeded to independently create children constructed of between one and five plastic cubes with a small motor inside. It tested which one did best and then used the results to inform the design of the next generation, so that preferential traits are passed down from one generation to the next.

In each of five separate experiments, the mother designed, built and tested generations of 10 children, using the information gathered from one generation to inform the design of the next.

The results, reported in the open access journal PLOS One, found that preferential traits were passed down through generations, so that the fittest individuals in the last generation performed a set task twice as quickly as the fittest individuals in the first generation.

College Corner



Georges Kipouros, P.Eng.
Dean and Professor, College of Engineering,
University of Saskatchewan

September is always filled with the excitement of a fresh start at the university, as we welcome back new and returning students. This new academic year brings particular satisfaction after we completed the accreditation review of our undergraduate engineering programs by the Canadian Engineering Accreditation Board (CEAB) in 2014-15.

Our results, received in June, were good news. All our programs achieved full accreditation – confirmation that we continue to provide a solid undergraduate education for our new and future engineers. Seven of our eight undergraduate programs were accredited for the maximum six-year period. Environmental Engineering, a newly formed program, was accredited for three years with the possibility of extension for an additional three years.

On September 9-10, our second-year undergraduate and graduate students will participate in our third annual Safety Days, where they will benefit from information and wisdom from several of our industry partners. Our second-year undergraduate students will also enjoy an evening of special recognition on September 9 with our second annual Hard Hat Ceremony, welcoming them to their engineering program disciplines.

Later this fall, we will host a gathering of about 300 grade 11 and 12 students from Saskatoon and area during What is Engineering? – an annual event we co-host with the University of Regina Faculty of Engineering (who hold a similar event in Regina). Also, students are busy organizing our second annual Engineering Connections, a special showcase of the amazing and varied student groups of the College of Engineering.

January will see two of the year's largest events for our college. Mark your calendars for Cameco Spectrum 2016 – Shaping the Future, which a group of dedicated student organizers are pulling together for January 14-17 in the Engineering Building at the U of S. Learn more at spectrum.usask.ca. Finally, save the date for the 40th C.J. Mackenzie Gala of Engineering Excellence coming up on January 26, 2016, at TCU Place in Saskatoon. We will honour a distinguished alumnus from electrical engineering this year, while providing an exceptional venue for our students and industry to connect.

Many of our upper-year undergraduate students are currently completing internships through the Engineering Professional Internship Program. We are proud of the 91 students, a record, who were placed this year. The program has launched a new website at engineering.usask.ca/internship.

I hope you will find many opportunities – including, but not limited to these – to connect with our students, faculty and staff this year.

News From The Field

INFRASTRUCTURE



Canadian canola companies build on homegrown demand

The Globe and Mail - The timeless Canadian complaint is about its natural resources – that the country exports everything from raw timber to iron ore and therefore misses out on the so-called “value-added.” Companies such as Richardson and Cargill Ltd. are also expanding their Canadian canola crushing, refining, processing and packaging plants, as farmers grow more of the lucrative oilseed.

Saskatchewan exported \$2.5-billion worth of canola seed last year, making it the province’s most valuable agri-food export. By way of comparison, Saskatchewan exported \$2.2-billion worth of non-durum wheat last year. The province also shipped \$1.3-billion in canola oil out of the country and \$786-million in canola meal, according to the government’s 2014 export report.

In Yorkton, Sask., Richardson can now process 1,047,000 tonnes of canola seed each year, up from the 837,600 tonnes it could absorb when it opened in 2010. Cargill opened the company’s largest canola refinery in North America this summer in Clavet, Sask. It can refine about 450,000 tonnes of canola oil each year.

Children’s hospital – over budget, behind schedule

Global News - The final piece of approval in constructing the Children’s Hospital of Saskatchewan received a unanimous vote. The Saskatoon Regional Health Authority (SRHA) voted in favour of awarding the construction contract of the highly anticipated hospital to Graham Construction and Engineering LP (Graham).

Construction began in September at the site which is mere metres west of the Royal University Hospital. Awarding the contract to Graham is a big step forward but the project is behind schedule and over budget.

SRHA board members had hoped for a 36-month build-out, but after consulting with the contractor, the time frame has changed. Construction is now estimated to take 48 to 52 months, meaning completion is now anticipated for 2019.

Another change to the project is the cost. Graham’s bid was 10 per cent above what planners had estimated.



Regina skateboarders flock to engineer-designed park

CBC News - People in Harbour Landing have a new place to hang out and skateboarders have a new spot to try out their tricks now that Norseman Park has officially opened.

Dream Developments, the company that developed the Harbour Landing area, held a big event to launch the park, located south of Gordon Road.

The skate park was designed by former American pro-skateboarder Kanten Russell, who came for the grand opening.

Working with the design and engineering firm Stantec, Russell designed a skatepark that could accommodate beginners and experts.

Based on his experience, Russell said having a designated spot for young people to ride keeps them out of trouble.



Regina LeaderPost

Regina's rail lands project moves ahead with design work

CBC News - A plan to build homes, stores and entertainment venues that could change the face of downtown Regina is chugging ahead.

It's the railway renewal project, the second phase of the city's plans to revitalize the downtown. The stadium is phase one.

The Canadian Pacific Railway land is 8.1 hectares (17.5 acres) north of Casino Regina and the Cornwall Centre and south of the warehouse district.

The city previously said it will pay CP \$7.5 million for the land and spend another \$2.1 million for an environmental cleanup.

The city announced it has awarded contracts to a design firm and an engineering firm on the 8.1-hectare parcel.

The redevelopment is scheduled to begin next year, but the project may not be complete until 2025 or later.

UNIVERSITIES AND RESEARCH



mylloydminsternow.com

Lakeland College shows off new Energy Centre

Meridian Booster - On Wednesday, August 26, Lakeland College officially opened the doors to its new Energy Centre at the Lloydminster campus.

Lakeland College is the only post-secondary institution in

Western Canada to create an integrated power plant featuring a once-through steam generator (OTSG) for heavy oil training. That's just one of many features of the facility.

Alice Wainwright-Stewart, president of Lakeland College, says people at the college are excited to show off the Energy Centre to people in Lloydminster and beyond.

"The design of the Energy Centre, including the slanted glass wall on the east side facade, has attracted a lot of attention. We think people will be just as impressed when they get inside the building and see the various training spaces and the incredible technology that fills the power engineering and heavy oil lab," she says.

While the majority of students are from Alberta and Saskatchewan, a few are from Ontario and British Columbia.

D Sask. earns D grade in innovation

Saskatoon StarPhoenix - Saskatchewan produces plenty of innovative ideas, but struggles to transform them into marketable products and services, a new report says.

The province received high marks for "entrepreneurial spirit" and "enterprise entry" but poor or very poor grades on research and development and its ability to attract venture capital, the Conference Board of Canada's *How Canada Performs: Innovation* report card says. The report awarded Saskatchewan a D grade - behind Alberta and ahead of New Brunswick and Prince Edward Island.

The province's weaknesses can be explained by the nature of its economy and small population, said Conference Board principal research associate Daniel Munro.

"Economies that rely heavily, or have historically relied heavily, on primary resource exports, have had a different track record on innovation," Munro said. "(They) have been as innovative as they've needed to be."

In other words, resource economies can achieve high productivity and standards of living without high levels of innovation, he added.

"The challenge is when resource prices become more volatile. (Then) the standard of being as innovative as you need to be actually starts to go up."

The report gave Sweden, Denmark and Finland A grades, and the United States, Switzerland and the Netherlands B marks. Strong performances in Ontario, Quebec and BC pushed Canada's overall grade up to a C.

More investment in research and development, increased support for information and communication technologies and a greater emphasis on management training could help Saskatchewan achieve a better grade, he said.

Jerome Konecsni, the president and CEO of Innovation Saskatchewan, says the province is already making strides to improve innovation.

Innovation Saskatchewan is a government agency charged with driving innovation in the province. Konecsni said the organization's plan involves building extensive supply chains for the province's three main natural resource sectors - agriculture, mining and oil and gas - which can then diversify and continue growing.



naturallycuriouswithmarlyhollandwordpress

Cutting-edge U of S snake-eye skin research

Burnaby Now - A Burnaby high school student says research he helped conduct on garter snake eyes this summer could lay the groundwork for the creation of bionic contact lenses someday.

Andrew Xia, a grade 11 student at Burnaby Central Secondary, spent most of July at the University of Saskatchewan in SHAD, a summer program hosted at 12 Canadian universities and aimed at giving exceptional high school students more high-level exposure to science, technology, engineering and math.

Xia was one of 10 students at SHAD Saskatchewan's 48-student program given an opportunity to conduct research using the Canadian Light Source synchrotron, a huge, doughnut-shaped ring that accelerates a stream of electrons and manipulates them to create a beam of light billions of times brighter than the sun.

The rare light can then be used by researchers to observe structures and chemical reactions at a molecular level.

Xia and his team decided to study the scales on the eyes of garter snakes.

"Snakes have special spectacle scales," he said, "and we decided to conduct experiments on that because there's not a whole lot of research done into spectacle scales."

"We believe that there are special characteristics of the snakeskin eyelids that make it transparent while having those three layers, and there could be correlations between that and the human eye," Xia said. "There might be a possibility to have it improve human eyesight, but we're not very sure yet."

OIL AND GAS

Earthquakes from fracking not likely in Saskatchewan

CBC News - A geological expert in Saskatchewan says there is little likelihood of an earthquake in this province from fracking. But there have been quakes triggered by other industries in the past.

It's a question many are asking after CBC confirmed that a 4.4 magnitude earthquake in BC last year was triggered by fracking.

Fracking is the process of injecting water, sand and chemicals at high pressure deep underground to break rock and free gas.

Don Gendzwill, professor emeritus of geological sciences at the University of Saskatchewan, said the BC earthquake was likely triggered because of the pressure that exists inside of the rock.

"The cracking of the rock by the hydro-fracturing is only capable of generating relatively small amounts of energy," he explained. "If there is natural pressure inside the rock due to ancient mountain building or something, then you have the possibility to release a larger force."

Gendzwill said there is a lot of hydro-fracking happening in the Bakken oil fields. But the rock in Saskatchewan doesn't have much natural pressure inside it.

Even still, there have been earthquakes before in Saskatchewan, including some triggered by industry.

Gendzwill estimated that there have been about a dozen small earthquakes due to salt dissolution.

And he said there have been a few examples of small earthquakes near potash mines. Gendzwill recalled the largest one at a magnitude 3.8, capable of rattling windows on nearby farms.

Even though the earthquake in BC was relatively low in terms of magnitude, he said it's still a concern.

"It's a substantial earthquake and it could cause damage, especially because it's at a relatively shallow depth."

Saskatchewan developing its oil sands?

Alberta Oil Magazine - As in Alberta, the oil in Saskatchewan once seeped from the riverbanks. But that's where the two stories diverge, with Saskatchewan's oil sands destined to play the poor cousin to its wealthier western neighbour. While one could argue that Saskatchewan's untapped bitumen reserves – somewhere between two billion and eight billion barrels – amount to very little when stacked next to Alberta's 1.8 trillion, the

real reason for the development gap is a cruel fact of geology. Although only about 10 per cent of Alberta's bitumen is economically recoverable with today's technology, not a single drop of Saskatchewan's is. Too deep to mine and too soft and porous to steam, Saskatchewan's oil sands reserves are suspended in a kind of limbo.

But that may be about to change. That's because there are researchers on both sides of the border who say development of the sands isn't a matter of if but when.

"It seems to me that the SRC [Saskatchewan Research Council] has the ambition to start another huge Saskatchewan oil sands program," says Peter Gu, a petroleum systems engineer at the University of Regina.

SRC's vice-president of energy, Mike Crabtree, told the CBC earlier this year that the technology could be solved as soon as 2020. The focus of those technologies is on low-pressure extraction using solvents and less aggressive heat sources to avoid softening up and compromising any existing clay or cap rock surrounding the reservoirs.

Of course, even if the bitumen could be economically extracted from the ground in Saskatchewan, the problem of market access remains. And while getting produced bitumen out of Saskatchewan will be a challenge, a bigger one might be preventing the technology which liberates it from fleeing the province once it's established.

"The problem for Saskatchewan is that if they develop that technology for use in Saskatchewan, there are a lot more formations in Alberta that can also use that technology," says the University of Calgary's Paul Chastko.

ENVIRONMENT

Scientists are tracking impact of vanishing ice

Yale University - Canada's "Cirque of the Unclimbables," mountains located on the edge of the Bologna/Brintnell icefields along the border of the Yukon and Northwest Territories, are the focus of Canadian scientists due to vanishing ice.

Between 1982 and 2008, this glacier-covered area in the Selwyn Mountains contracted by about 30 per cent, from 101 square miles to 71 square miles. Its retreat has accelerated since then.

Scientists from the University of Victoria, the University of Saskatchewan and the Geological Survey of Canada have been studying the ice melt. They are optimistic that the data they are collecting will, in time, give them a clearer picture of what is happening in this part of the world.



science.gc.ca

The fact that a cluster of glaciers in the Northwest Territories is melting is hardly earth-shattering news. A recent report by the World Glacier Monitoring Service indicates that hundreds of observed glaciers around the globe are currently losing between half a metre and one meter of ice thickness every year.

What makes the Brintnell/Bologna and nearby glaciers unique is that they comprise the last extensive icefield remaining in the interior of Canada's Northwest Territories. And because temperatures are rising so rapidly here, the icefield appears to be melting at a rate three times the global average cited in the World Glacier Monitoring Service report.

With the ice and snowpack in the Rocky Mountains melting, spring weather noticeably warmer and snowpack in the Mackenzie Mountains diminishing, the demise of the Brintnell/Bologna icefields is a strong indicator of what the western Arctic of North America might face in the future.

Climate change is already manifesting itself in a variety of ways in this largely unexploited wilderness. Northern Transportation Company Ltd., which delivers food to Aboriginal communities and to oil and mining camps in the western Arctic, was forced to alter its barge schedule on the Mackenzie River this year after unprecedented low water levels prevented barges from reaching the Arctic coast last August. Scientists say that by mid-century, 15,000 of the 40,000 lakes in the Mackenzie Delta could dry up if the climate continues to warm as forecast.

MINING

Claude Resources suspends operations after fires

Canadian Mining Journal - Where there's smoke there's fire, is exactly what Claude Resources didn't want to happen to its Seabee Gold Mine in northern Saskatchewan when smoke and heavy ash from nearby forest fires recently forced the company to suspend production for the safety of its workers.



In fact, with less than 10 km separating the mine from the leading edge of one of the 112 fires (including 25 that were out of control) that devastated more than 600 000 hectares of vegetation in northern Saskatchewan, the company had no problem making the decision to evacuate and temporarily suspend underground mining at the mine site.

As company president and CEO Brian Skanderbeg said, “Our number one priority is the safety and well-being of our employees, and as a precautionary measure during the recent fires, we moved all non-essential personnel from the site to help ensure that nobody was in danger.”

Production at the mill, however, was not affected because the company had a stockpile of approximately 10 000 tonnes of ore available on surface, representing about 12 days worth of production.

Now with the fires out and everyone back at work, the mine is up and running again.

The Seabee Gold operation is located in the La Ronge Mining District at the north end of Laonil Lake, approximately 125 km northeast of the town of La Ronge and about 150 km northwest of Flin Flon, Manitoba.

There are approximately 260 people working at the mine.

URANIUM AND NUCLEAR

Nuclear watchdog slams uranium report

The Globe and Mail - Tempers are flaring in some quarters of Quebec after the head of Canada’s Nuclear Safety Commission slammed a report by the province’s environmental regulation agency for allegedly “misleading Quebecers and Canadians” on the safety of uranium mining.

In a damning letter to Quebec Environment Minister David Heurtel, the president and chief executive officer of the Canadian Nuclear Safety Commission, Michael Binder, says it “is very troubling to have the [provincial agency] present

your government with conclusions and recommendations that lack scientific basis and rigour.”

Quebec’s Bureau d’audiences publiques sur l’environnement (BAPE) recently released a 626-page report recommending to the Environment Minister it would be premature at this time to authorize development of a uranium mining industry in the province.

To “suggest that uranium mining is unsafe is to imply that the Canadian Nuclear Safety Commission (CNSC) and the Government of Saskatchewan have been irresponsible in their approval and oversight of the uranium mines of Canada for the last 30 years,” Dr. Binder says in his letter, dated July 27 and copied to Pierre Baril, president of the BAPE.

Characterizing CNSC staff as internationally recognized “scientific and regulatory experts,” Dr. Binder says they provided the BAPE panel with “solid, factual evidence” on how Canadian nuclear-related activities are among the safest and most secure in the world.

The BAPE’s recommendation is “based on the perceived lack of social acceptance [of uranium mining] and not on proven science,” Dr. Binder adds.

The letter triggered a slew of newspaper columns, editorials, op-ed pieces and letters.



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Calendar Of Events



Canadian Dam Association 2015 Annual Conference

October 3-8, 2015
Mississauga, ON
www.imis100ca1.ca/cda

ACHIEVE Training - Coaching Strategies for Leaders – Conflict, Performance, Change

Saskatoon – October 13, 2015
Regina – October 16, 2015
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ACEC-SK 2015 Awards of Distinction

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www.acec-sk.ca

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Saskatoon, SK
www.acec-sk.ca

Professional Development Days: PIEVC Workshop

November 5, 2015
Saskatoon, SK
www.apegs.ca

Professional Development Days: APEGS Volunteer Appreciation Reception

November 5, 2015 (evening)
Saskatoon, SK
www.apegs.ca

Professional Development Days: Ethics and Technology

November 6, 2015
Saskatoon, SK
www.apegs.ca

Professional Development Days: Media Relations

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Saskatoon, SK
www.apegs.ca

Professional Development Days: Effective Public Speaking

November 6, 2015
Saskatoon, SK
www.apegs.ca

Hydraulic Modeling of Water Distribution Systems Seminar

November 06, 2015
Vancouver, BC
www.apeg.bc.ca/Events/Events/15NOVHMO

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Saskatoon - November 12, 2015
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Saskatoon – November 13, 2015