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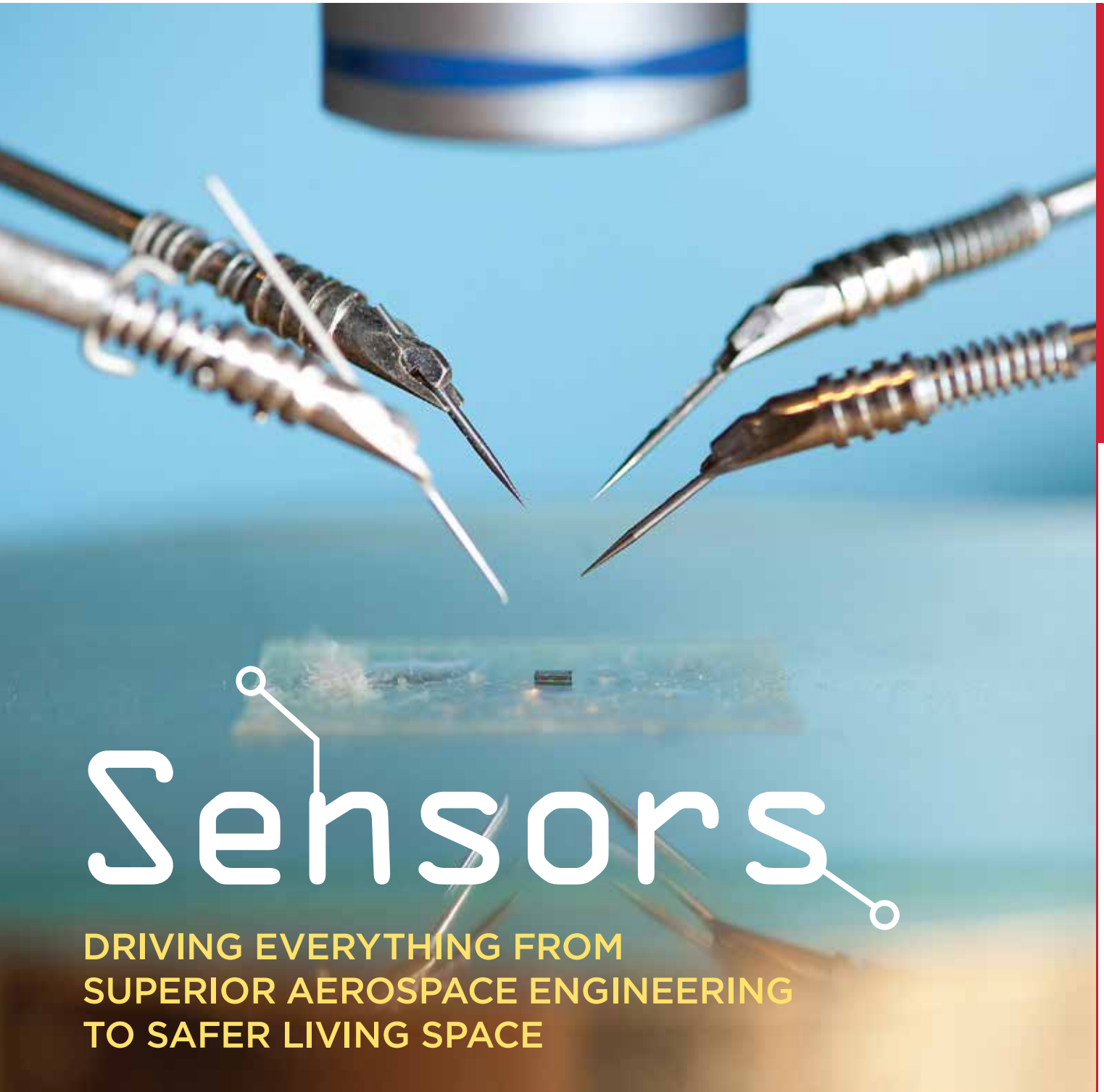
NEWSLETTER OF THE FACULTY OF ENGINEERING AND DESIGN

Spring 2015



Sensors

DRIVING EVERYTHING FROM SUPERIOR AEROSPACE ENGINEERING TO SAFER LIVING SPACE

Carleton is helping to shape the future of sensor data collection

Carleton UNIVERSITY | Faculty of Engineering and Design

Aerospace—The Bigger Picture

The Faculty of Engineering and Design at Carleton offers many of the best engineering degrees in Canada. Some programs, like Computer Systems Engineering, Electrical Engineering, Communications Engineering and Software Engineering, are preparing grads for industries on the leading edge of technological innovation that now require a huge new talent pool to continue to thrive. As well, our Architectural Conservation and Sustainability Engineering program is a one-of-a-kind offering and a real game changer in the engineering landscape.

Our Faculty also continues to make real strides in the aerospace sector. We live in a world where aerospace technologies inform many facets of our cultural fabric. And beyond the planes and drones that move our imaginations is the bigger picture. For the most part, these flying machines are multi-processor computers, network resources, sensor arrays, infrastructure security devices and much more. The concept of aerospace actually embodies almost every aspect of modern engineering.

Our Faculty acknowledges this reality and embraces every area of aerospace research. We know that a better jet engine also needs better electronics and software. We understand that a properly functioning space station needs health and air quality monitoring systems as much as it needs jet propulsion to bring the flight crew on board. We realize that air travel also requires passenger safety, security and comfort as much as it needs the aircraft.

In this issue, we're going to look at a few of the new ways that we conduct our research into this bigger picture by including a very strong element of research that changes everything—interdisciplinary and cross-disciplinary projects. The flight simulator is a perfect example of this; engineering and psychology have come together to find better ways of designing cockpit instrumentation. We'll explore the value of co-op education, and we're going to talk about sensors and real-time analytics—the fulcrum of modern engineering.

We're also going to showcase some of our excellent alumni who are leading by example. Dr. Walter Chudobiak set up a large fund to help engineering grads realize their entrepreneurial dreams, and Dr. Shona Brown was recognized with an honorary degree due to her leadership role in helping to build Google into what it is today. Ross Koningstein, another great grad and Googler Emeritus, continues to explore the future of engineering while also ensuring that Carleton remains a recognized leader in that engineering world.

We invite you to remain connected with that future as well. We host many events throughout the year, either out of our office or in concert with the Alumni Association, and we invite you to return for a visit any time. As well, we are active on Twitter, Facebook and LinkedIn and we welcome you to join us there. There are many ways to partner with us, so please contact us any time if you have questions about how you can stay involved with this Faculty of Engineering and Design.

Our students, faculty members and alumni are more than the sum of their parts—they are an international network that, through their hard work and innovation, are changing the world every day. This is the big picture.

Rafik Goubran, PhD/87, PEng
Dean, Faculty of Engineering and Design

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carleton.ca/engineering-design/ingenious

On the cover

Four probes are being landed on the miniature wireless sensor chips developed for blood bag irradiation measurement (see article on page 6). Due to their small size, this is the only way the chips can be tested in a laboratory environment and under the microscope.
Photo: Raymond Peterkin

Newsletter Mission Statement
Ingenious is published for the alumni, faculty, staff, friends, and partners of the Faculty of Engineering and Design. The newsletter is intended to communicate the Faculty's goals, strategic direction, and activities in order to connect alumni to each other and the university.

Photo:

Left to right: Steve Tippet, Mohamed Emara, Sierra Bianca, Graham Blackport, Faraaz Ahmed, Brian Lemky, Steve Humphreys

Carleton Co-op Success–An Employer's Perspective

Carleton's Co-op program gives students the opportunity to work on real-life engineering problems while giving employers access to great minds with fresh ideas. We talked with Flextronics, a longtime co-op employer for the Faculty, about its experiences with co-op and why there is so much value in the 16-month work terms Carleton offers.

Flextronics International Ltd. is a supply chain solutions company that offers design, manufacturing, distribution and aftermarket services to original equipment manufacturers. Its operations span more than 30 countries and four continents, and they have a global workforce of 200,000.

A state-of-the-art engineering and testing facility in Kanata is the destination for Carleton co-op students.

The fit for the Faculty of Engineering and Design is perfect. "We've touched every aspect of technology in the electronics market," says Steve Humphreys, director of business operations.

Flextronics operations in Ottawa are focused on design and testing, offering engineering students a range of work terms supporting these elements of the business. "Design has become the differentiator, the ability to design product quickly sets us apart," says Steve Tippet, engineering services manager. "To do that, you a need large pool of engineers who know what they are doing, and if you can scale that by incorporating co-op students, that's great."

Ten years ago, when Flextronics first went looking for co-op partners, there were lots of choices. However, they recognized Carleton as having a large pool of talent and a good program. "Most importantly, Carleton was responsive to our requests and our needs. The co-op office is a real asset," says Tippet.

When it comes to choosing co-op students, Flextronics takes into account more than just GPA. "Students with a well-rounded resume who have interesting outside experiences and who have demonstrated their talents will get more opportunities," says Tippet.

As well, having these young minds available changes the way Flextronics does things. Instead of issuing directions, managers ask students how they would approach a problem. This sometimes results in new ideas and new directions.

Flextronics chose the 16-month co-op work term option because it gives them the chance to expose students to both theoretical and practical elements and gives them the foundation to be very useful to the company. "And even better, they become so efficient that they can actually mentor the next group of incoming students, and that's working extremely well," says Tippet.

The students also see value in co-op, and especially the 16-month Flextronics placement. "Flextronics offers the greatest variety of labs, tests and projects for students to work on—it's a really busy place!" says co-op student Mohamed Emara.

But there's a more important aspect to this for Flextronics. Although there are no plans for growth at this particular installation, an aging population means future jobs in the electronics and communications fields. "So what we're really doing is training the next generation of engineers, many of whom will replace the current workforce over time," says Tippet.

And down the road, if there is a spot available when these same students graduate, Flextronics would absolutely consider them for employment. "They're the perfect employee—they know your processes, your systems, your culture," says Tippet

Flextronics bills itself as an exciting place to work. Due to the variety of projects coming through the door, no one gets boxed into one product or one technology. It's a very forward-looking organization to consider for a co-op work term or a career.

Ross Koningstein
—The California Connection

Alumnus Ross Koningstein, BEng/84, and his wife Patti, opened their home in Atherton, California for an informal reception of fellow alumni, co-op employers and faculty members.

Dubbed the "2015 California Meet-up", the event was an opportunity for expat Carleton graduates to get together, talk about new ideas in technology, share stories about their experiences in California, and reconnect with some Carleton professors and students.

Ross moved to California in 1999 at the height of the Internet boom. After stints at two startups, he joined Google as their first director of engineering. "Those years were amazing in Silicon Valley," says Koningstein. "There were so many young engineers and entrepreneurs with big dreams. Aspects of it reminded me of my Carleton days—lots of hard work and many late nights, but we found time to have fun and learn from each other along the way."

Photo: Luther Caverly

"Those years were amazing in Silicon Valley. There were so many young engineers and entrepreneurs with big dreams. Aspects of it reminded me of my Carleton days—lots of hard work and many late nights, but we found time to have fun and learn from each other along the way."

Ross credits Carleton for providing a broad engineering foundation that allowed him to be an engineer on some interesting projects at Google, such as their first custom-design energy-efficient data center, and RE<C, its R&D effort into renewable energy cheaper than coal.

At the April reception, Carleton was represented by University Chancellor Charles Chi, President Roseann O'Reilly Runte, Dean of Engineering and Design, Rafik Goubran, Professors Paul Van Geel and Shikharesh Majumdar, among others.

Alumni swapped stories about both work experiences and personal experiences, made some new connections, and learned more about what is presently happening at Carleton. They also heard about opportunities to help their alma mater.

In addition to hosting the event, Ross contributed more than $100,000 to support priority areas in the Faculty of Engineering and Design. Thanks to his support, a new fund in support of engineering students undertaking their fourth-year capstone projects was launched.

This fund, when given additional support from other donors, will allow students to apply for much needed resources to enhance the quality of their projects. Two fourth-year students joined the Carleton contingent in visiting Northern California to share their capstone experience with the alumni in attendance. Ross is matching donations received before Canada Day from California residents to a maximum of $5,000. More information is available at http://bit.ly/californiachallenge.

Thanks to this contribution, Carleton will also be able to offer a scholarship to students enrolled in the innovative Sustainable and Renewable Energy Engineering program. The first of its kind, this scholarship will go towards celebrating the accomplishments of students enrolled in this emerging area of study.

If you missed this "California Meet-up," don't worry—we'll be back.

The Roadmap of Zak El-Ramly

The Annual Roadmaps lecture was held on March 4 with engineering graduate Dr. Zak El-Ramly, MEng/72, PhD/75.

Dr. El-Ramly has been instrumental in shaping and building the privatized energy market in North America. Over the course of his career he has provided expert testimony for multiple national and international regulatory commissions and has participated in the negotiation of major international treaties.

He has also been a private sector leader in the energy marketing and commodities sector and founded ZE PowerGroup that created ZEMA, an enterprise data management system used worldwide.

His talk focused on setting goals, understanding the importance of a direction, and the value of preparing yourself for success.

"Having a vision is important," says El-Ramly. "If you find yourself in a place in your life that you don't want to be, it's a solid vision that will move you to the next level, closer to your vision of your future."

Dr. El-Ramly traced the steps in his own life from his beginnings in Egypt and Kuwait, through his graduate studies at Carleton, on to his work in the public sector and the establishment of his own enterprise. He outlined many of his business and personal experiences. Through it all, he had a vision of what success might look like.

"I realized I had to stay ahead of the curve," he says.

Staying ahead of the curve: Zak El-Ramly shares his recipe for success at Roadmaps lecture.

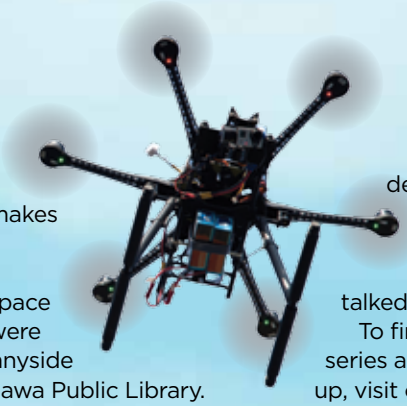
"I had seen small ideas grow into big ones at Carleton, and the power of new ideas has stayed with me."

Roadmaps is a series of discussions with prominent entrepreneurs who share their advice on the routes that led from a university education to a fulfilling career.

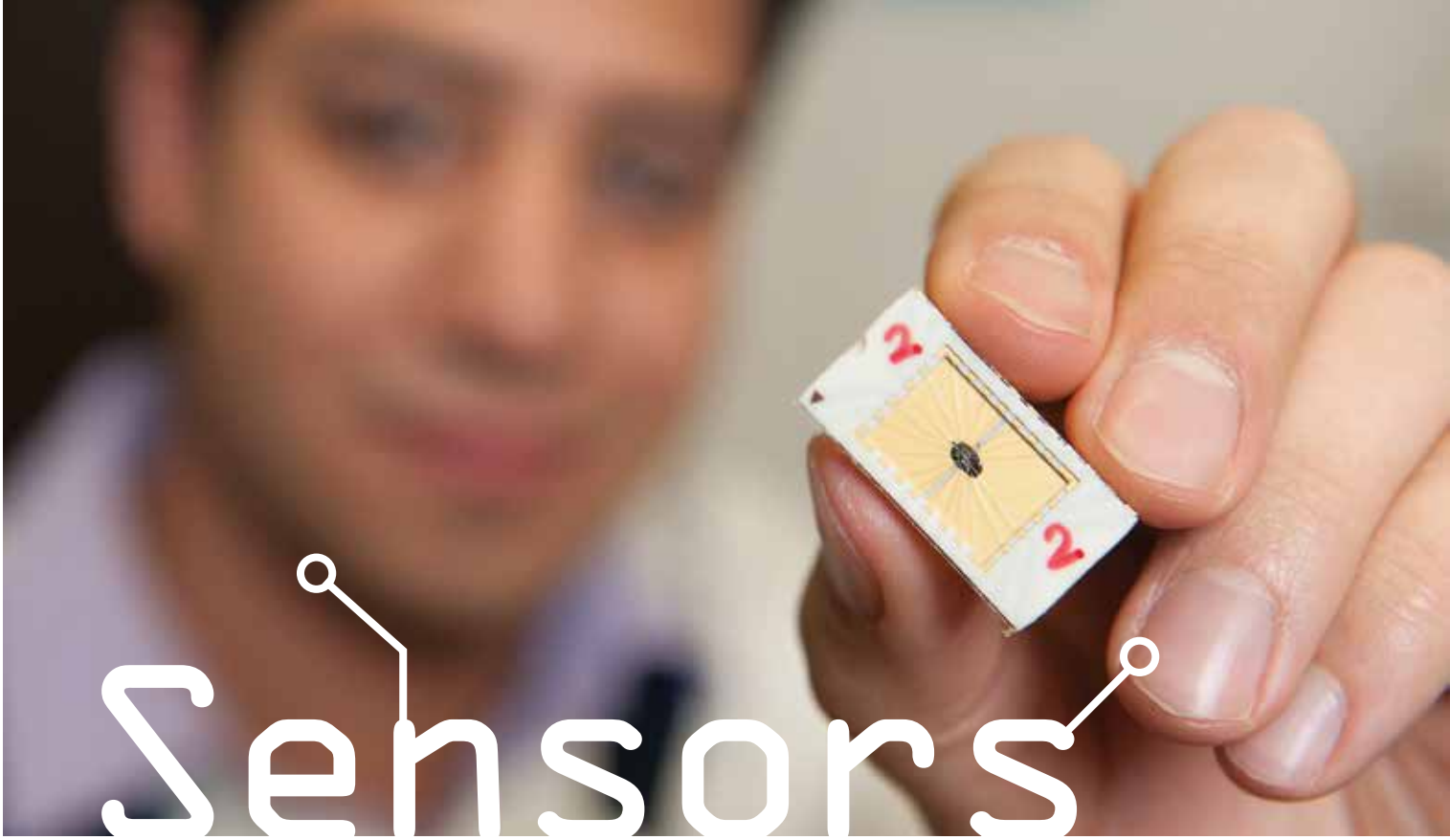
ingenious TALKS

The Faculty of Engineering and Design has created a new outreach lecture series called Ingenious Talks —a speaker series that engages audiences in discussions of timely and innovative ideas in engineering, design and technology. Free and open to the community, Ingenious Talks makes engineering accessible and helps illustrate the difference that applied science and technology makes in our daily lives.

Talks this year focused on aerospace technology and were hosted at the Sunnyside Branch of the Ottawa Public Library. Prof. Jeremy Laliberte spoke about drone technology, Prof. John Hayes described the unique Atlas Motion Platform developed at Carleton and Prof. Steve Ulrich talked about space robotics.



To find out more about this series and to see what's coming up, visit carleton.ca/engineering-design/ingenious-talks.



Sensors

Driving Everything from Superior Aerospace Engineering to Safer Living Space

There are few things in engineering that inspire the imagination the way that aerospace does. Creating machines that fly–within Earth's atmosphere and beyond–are some of the most visible results of aerospace engineering. In everything from enormous rockets carrying space station payloads to the tiniest of drones being used for aerial surveillance, we see the results of research in these machines.

But what makes these machines so special? They express every aspect of engineering, including computer systems and software, communications, industrial design, mechanical systems, aerodynamics and design, electronics, control system design, and more. These are flying computer systems, communications and network hubs, and multi-sensor arrays as much as they are vehicles for transport and discovery.

But this complexity also poses new problems to solve. These sophisticated machines require monitoring and maintenance to operate reliably and efficiently. This is critical when, in many cases, failure can have dire consequences. So the solution is to find a way to consistently monitor the health of the machine and those individuals operating them.

Dr. Jie Liu, assistant professor, Mechanical and Aerospace Engineering at Carleton, has been developing techniques and sensors that can monitor the health of a machine using vibration, sound, electrical charges and magnetic fields.

"Temperature and pressure have always been something that we can easily measure and display, but even with normal temperature and pressure, there may be other factors that are deteriorating the performance or that may be leading to failure conditions," says Liu.

"So now we use many sensors, measuring the variations in different properties, and deploy these into vehicles where real-time condition monitoring is critical."

Using these highly sensitive and tuned sensor arrays and the developed health monitoring technologies, even normal wear can be measured, as well as damage to specific parts that could lead to failure. At that point, it's the real-time data analytics that can pinpoint the area of concern and create an alert.

"We are certainly looking at this entire framework as a layered effort, using the hardware and sensors, the electronic components to ensure signal integrity, and the software component to provide analysis," says Liu.

This brings up an interesting facet of sensor data collection: we need to know the validity of the data, and we need to trust that the data being analyzed is not compromised.

This is an area of research that Dr. Adrian Chan, associate professor in Department of Systems and Computer Engineering, has been working on.

"First, we need to acquire the signal," says Chan. "We want to extract useful information from this signal, but before doing so we need to validate that the signal is working the way it should and can be trusted."

For this, specific algorithms need to be developed that can measure the integrity of data. "When we're talking about machine monitoring where we know what the

output should reasonably be, it makes the measurement and analysis of the signal easier. When we're measuring something biological where it's much more variable, that becomes more challenging," says Chan.

The new thinking is to deploy a vast array of dependable but inexpensive sensors rather than one very sensitive and expensive sensor. Redundancy in a sensor array allows for great accuracy and a threshold of failure that will not affect the data collected.

"Due to economies of scale, it has become easier to deploy many sensors instead of one high-priced one," says Chan. "If you have one expensive sensor and it fails, you have no data. If you have a thousand sensors and several fail, you still have the aggregate data that you can use—it's a different mentality, a different reality."

Of course, the more data you collect, the larger the analysis effort becomes. How do you sort through massive data sets to find the one piece that may signal an event?

"With such volumes of data, we need to able to detect those data clusters that represent a specific event and this requires a two-stage approach to data analysis," says Dr. James Green, associate professor in the Department of Systems and Computer Engineering. "We need to create a framework where the best artifact detection algorithms work together with clinical event detection algorithms. By defining a common interface for all components within the framework, we achieve unprecedented inter-operability, permitting novel combinations of best-of-breed artifact detection and clinical event detection algorithms," says Green.

The beauty of this is the ability of the framework to evolve and expand as the algorithms and data processing change. And, although the process is currently situated in human health monitoring scenarios, it could be adapted to suit any number of applications. In terms of scope, the ability to monitor an individual's health, from astronauts at the International Space Station to seniors in their homes, opens doors to even more widespread adoption.

In fact, Carleton is currently involved in research projects like the Canadian Arrhythmia Network and AGE-WELL, both of which will benefit from the ability to deploy sensors to monitor human health.

"If we want to increase the length of time seniors can remain in an independent living environment, the ability to embed sensors into floors, door knobs, bathroom fixtures and more can help us maintain real-time knowledge of an individual's health markers, such as pulse, blood pressure, perhaps even blood sugar," says Dr. Rafik Goubran, dean of the Faculty of Engineering and Design and a work group lead on the AGE-WELL project.

And, of course, these sensors and the real-time analysis of the data they collect can be applied to a broad range of challenges. Measuring the stress on the necks and backs of search and rescue personnel from the head gear they are required to wear is just one example of this type of broader application.

Beyond that, new wireless sensor platforms are being developed that have applications in biomedical and aeronautics fields, even nuclear facilities. Dr. Langis Roy, professor with the Department of Electronics, is working with industry partners to upgrade the process where blood is irradiated prior to transfusions. The current system has a simple tag on the package that changes to black when exposed to a certain level of radiation. The problem is that it doesn't measure the radiation beyond the threshold, and this can lead to the possibility of the blood being contaminated and wasted due to errors in human interpretation or machine calibration.

"We're now developing wireless sensors that can be customized to read the radiation levels, duration, and temperature and communicate these data back to the machine in real time," says Roy. "There is a unique tag on each bag, with a sensor less than a millimetre square that would be remotely powered."

When each unit of blood receives the exact level of radiation exposure for the application, the sensor signals the cycle to stop. And, although this is a specific project, the applications for miniaturized wireless sensors – that are self-powered or remotely-powered and can transmit data—offer limitless potential for deployment.

Consider the photo of the miniature drone. Now have that drone configured with miniature sensors that detect radiation or poison gas and can transmit those data back to a staging area. This self-powered flying sensor now has the ability to protect the lives of first responders and other emergency personnel in the field.

Sensors are now informing processes used to engineer more efficient turbines and homes that can help monitor our health and environment. Sensors, and the real-time data analytics that drive them, are more than the sum of their parts. They are shaping the future of engineering.

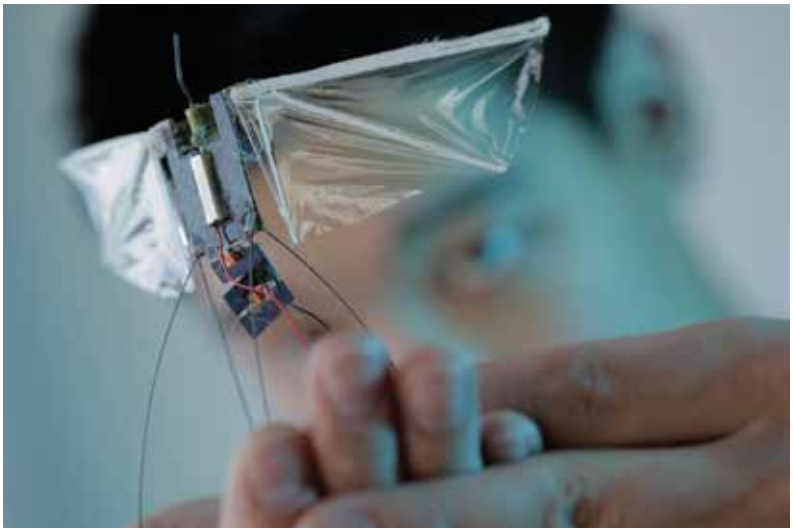


Photo: Wayne Eardley

Miniature drone

Photo: Luther Caverly

Full motion helicopter simulator at the Carleton University Visualization and Simulation Centre.

CARLETON'S AEROSPACE RESEARCH GOES INTERDISCIPLINARY

The cockpit of the future is about to undergo a major redesign. Surprisingly, it's not entirely engineering that is driving the change.

Instead, collaborative research is showing us that a few small flight indicators and a computer screen can replace the plethora of switches, dials and controls.

In essence, sensors will provide the flight controls with real-time data about the performance of the craft and will automatically adjust to those conditions. The pilot will simply monitor these changes and be ready to step in when the situation requires, especially in case of an emergency.

The design requires strong interdisciplinary studies. The people working most closely with this project are not aerospace researchers, but cognitive scientists. Extensive work takes place under Carleton's Herdman Centre for Applied Cognitive Research, run by Psychology Prof. Chris Herdman.

It's a collaborative effort meant to pave the way for learning in more than one field of study.

"We need sophisticated simulator platforms to produce scenarios for proper pilot training," says Metin Yaras, Carleton's chair of Mechanical and Aerospace Engineering. "It's one thing to push some buttons in a cockpit. It's quite another to do it while you are spinning," says Yaras.

This is where the intersection between engineering and cognitive science really takes shape. When specific behaviour under extreme conditions can be identified, controls are designed that are operational within those behaviours. It's more natural than trying to re-wire human behaviour to fit a specific set of controls.

Interdisciplinary thinking is a staple of aerospace research and development, and it's no different at Carleton. With co-operation from diverse areas of research and specialization, the knowledge pool and the technology are advancing in directions never before imagined, and the future in the skies is looking clear and bright.

With files from Elizabeth Howell

Carleton's Aerospace Facilities Visited by Transport Minister

Transport Minister Lisa Raitt picked National Aviation Day on Feb. 23, 2015 to tour Carleton University's aerospace facilities.

Recognized internationally as a leader in aerospace education and research, Carleton approaches the field from an interdisciplinary perspective, combining all aspects of engineering with other fields such as psychology and human computer interactions.

Raitt, who studied environmental biochemical toxicology and law, told a gathering of aerospace students and faculty that the federal government needs "informed science" in order to make good policy.

"Think about public policy in the future," Raitt said during a tour that included Carleton President Roseann Runte, Vice-President (Research and International) Kimberly Matheson, Aerospace Director Daniel Feszty and Research Associate Matt Brown.

Raitt toured several facilities, including the Advanced Cognitive Engineering Laboratory (ACELAB) in the Visualization and Simulation Building and the Rotorcraft Laboratory, where she examined a blade manufactured by Carleton's Rotorcraft Unmanned Aerial System research group.

Carleton has been conducting UAV research since the 1990s. In fact, Carleton is the only university in Canada to offer an undergraduate rotorcraft course. It was also the first in the country to offer a Bachelor of Aerospace Engineering program in 1988 and the first to build a whirl tower facility. Its state-of-the-art facilities include seven flight simulators and seven wind tunnels, featuring a new $1.25-million structure.

"I do a lot of work on the policy side of UAVs and

aerospace," Raitt said after the tour. "It's invaluable to get this perspective today and to see the next generation of scientists, researchers and public policy-makers."

Raitt's presence at Carleton "acknowledges the pre-eminence of our program," said Runte. "It demonstrates the interest of the government in aerospace as both an important part of our transportation portfolio, and also as part of Canada's leading research in the world."

Taking advantage of its unique location in the nation's capital, Carleton has developed collaborations with federal and provincial government departments, the National Research Council, NAV Canada, aerospace and aviation manufacturers and suppliers, the airline industry, and the high-tech, defence and security sectors.

With files from Susan Hickman

Co-op Profile – Ryan Seys

Carleton has a deep commitment to co-op education, and more and more undergrads are seeing the value of participating in the co-op program while they earn their degree. Fourth-year student Ryan Seys from Software Engineering decided on co-op even before he accepted an offer from a school.

"It's a no-brainer," says Seys. "Why would you not want to work in your field while you're earning a degree?"

Robin McLaughlin from Co-op and Career Services agrees. "Co-op gives you the opportunity to really understand the field you're going into, to learn about career options, and it allows employers a chance to see the amazing talent that Carleton offers."

Seys completed four co-op work terms during his program before successfully securing a summer internship at Google by contacting them himself as part of a self-directed job search.

Not only did he work there, but he's been offered a position, which he's accepted, to return full time to Google after graduation. "I can say that the co-op program contributed 100 per cent to getting the job offer from Google," says Seys.

He's also worked for other notable employers like Mozilla in California, and made an impact with other, smaller startups like Top Hat and Blindside Networks—a Carleton incubated startup that's making waves with its Big Blue Button project.

While no single co-op student's experience can be seen as typical, what is clear is that it can be as flexible as you want it to be and it makes the transition to a rewarding career a much easier task. "Having the projects already under your belt is a great opportunity to impress employers," says Seys.

For both students and employers, it's a win-win.

Giving to the Future of Engineering

Walter and Mary Chudobiak would like to see Carleton's graduate students complete their degrees by looking for employees rather than employers.

They have established the Dr. Walter and Mary Chudobiak Entrepreneurship Award in Electrical Engineering with a generous gift of $1 million.

Chudobiak was first drawn to Carleton's engineering programs because of the university's unique selection of graduate courses and because of its reputation for partnering with industry leaders.

"Carleton engineering has this sort of unique characteristic of being open to the outside world," he said. "It just exceeded my wildest dreams that I could be encouraged and helped to conduct off campus research in the Department of National Defence, Defence Research Board Labs where I started my professional career."

He obtained his MEng in 1965 and completed a PhD in Electrical Engineering in 1969. From 1969 to 1975, he was with the Department of Communications, Communications Research Centre in Ottawa, and he also served as a Carleton adjunct professor. He returned to Carleton in 1975 when he became an associate professor in the Department of Electronics, a position he held for six years.

Taking what he learned inside and outside of the classroom, Dr. Chudobiak decided to go out on his own to find success in a niche market.

He founded Avtech Electrosystems Ltd. in 1975, a company that his son Michael—who also has a PhD in electrical engineering from Carleton—is now running. The company specializes in design, manufacturing and marketing of nanosecond electronic test equipment and has grown to serve research and development laboratories in more than 53 countries.

"My company's success is the result of a combination of my graduate studies at Carleton University, my work as a faculty member and my work at the Defence Research Board and the Communications Research Centre," he said.

"It's payback time, as far as I'm concerned," he said. "I owe an awful lot to Carleton."

Jointly, with the Dean of Graduate and Postdoctoral Affairs, the Dean of Engineering and Design will grant the Chudobiaks' scholarship annually to one or more students who have shown an entrepreneurial spirit.

"This scholarship will reinforce the longstanding, international reputation the Faculty of Engineering and Design has for its excellence in education and research," said Dean Rafik Goubran.

"As our engaging program offerings continue to grow and adapt to the changing needs of the outside world, we strive to ensure our graduates have the knowledge and skills to shape the future," explained Goubran. "I sincerely thank Dr. Walter and Mary Chudobiak for their incredibly generous contribution and also for encouraging a culture of entrepreneurship amid Carleton's engineering students."

Photo: Chris Roussakis

Walter and Mary Chudobiak have established the Entrepreneurship Award in Electrical Engineering with $1-million donation.

With preference given to students working in hardware design, students who are accepted to Carleton's graduate program are eligible to receive the award following completion of their Bachelor of Engineering degree at Carleton University.

Hasan Orion Ayyad became the first recipient of the award. With a particular interest in radio frequency integrated circuits, Ayyad hopes to own his own company in the future.

"I would like to become a specialized expert in this area of research, and I am positive that this scholarship has provided me with the financial support to kick-start my graduate studies," he said.

"Because of the Chudobiaks' generosity, if I ever find myself in a situation where I'm able to, I will definitely give back so that others can have the tremendous opportunity I have been given."

With files from Catherine kitts

Mawuena Torkornoo addresses event to mark anniversary in Alumni Park.

Virtual Ventures Celebrates 20th Anniversary

Carleton University's Virtual Ventures celebrated 20 years of inspiring children about technology and engineering programs with a celebration event that took place July 26, 2014.

"Carleton has been a key part of our success and we feel privileged to be part of such a wonderful institution," said Mawuena Torkornoo, director of Virtual Ventures.

Hannah Johnston, interaction designer at Google and a past camper, volunteer, staff member and co-director of Virtual Ventures, talked to attendees about her experiences and the important role the camp played in her life.

"Hearing from Hannah was extremely encouraging, as it shows how our program can empower females to thrive in science, technology, engineering, and math (STEM) professions," said Torkornoo. "She certainly inspired those present with her story."

Carleton engineering students started Virtual Ventures in 1994. Since then, the program has reached over 20,000 children through innovative technology education. Virtual Ventures is a not-for-profit organization run by students who want to make a difference in young lives. It offers nationally recognized technology and engineering programs for those who have completed grades 1 through 10.

Programs run through Virtual Ventures include summer camps, fall and winter clubs, a school outreach program, and Girl Guide and Pathfinders STEM badge days. Carleton also offers dedicated programs for girls and Aboriginal youth.

Carleton Hosts Hour of Code

The Hour of Code has become a global movement. More than 77,000 events have been held around the world since it was launched in 2013 in the U.S. by Code.org, a non-profit with a goal to expand the participation of women and under-represented students in Computer Engineering.

The week-long event is designed to provide anyone (young and old) the opportunity to try coding for a least an hour throughout that week. The hope is to demonstrate that computer coding is easy to learn. It is especially important now that it has become a necessity to have basic computer science knowledge no matter what field you choose.

In 2015, Hour of Code became an international phenomenon with 99,431,890 total students participating in events all over the world, including U.S. President Barack Obama. Carleton hosted an Hour of Code event in December 2014 with approximately 80 participants, organized through Virtual Ventures. Participation in Hour of Code is driven by the Virtual Ventures mission to empower youth in Ottawa with basic technology skills that will help them succeed in life, and also to drive the STEM education initiative.

Google executive Shona Brown encourages graduates at fall Convocation to embrace risk and passion.

Dr. Shona Brown Awarded Honorary Degree

Dr. Shona Brown – BEng /87 – was honoured during the annual Fall Convocation on Saturday, Nov. 15, 2014 with an honorary Doctor of Laws degree in recognition of her ground-breaking leadership and innovation in engineering, social media and business.

Brown has a Bachelor of Computer Systems Engineering from Carleton, as well as an MA in Economics and Philosophy from Oxford University (which she attended as a Rhodes scholar), and a PhD and postdoctoral degree from Stanford University's Department of Industrial Engineering and Engineering Management.

In her remarks, Dr. Brown emphasized the need to take risks and analyse the results.

"Don't overthink your next career move," Brown said during her address to the graduating class. "Embrace sufficient risk, so that if you fail, it will be a spectacular learning experience. Finally, ensure that whatever choice you make, it's one you're truly passionate about."

As a member of Google's executive team since 2003, Shona Brown's responsibilities as SVP, Business Operations, were to build both the People Operations and Business Operations groups. In 2011, she transitioned to a role leading all of Google's technology for social impact efforts, and in January of 2013 she became a Googler Emeritus and moved into an advisory role with the company.

"Thoughtful leadership and creativity characterize our honorary degree recipients," said Carleton President Roseann O'Reilly Runte.

In addition to her ongoing role with Google, Brown is also currently serving in an advisory role with a small portfolio of technology startups to help the next generation of technological visionaries steer the future.

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