TEAM SPIRIT
It’s brains over brawn for Waterloo’s top competitors

OUT OF THIN AIR
How 3D printing helps innovation take shape

HARDWARE REVOLUTION
Manufacturing the future, from wearable technology to high-tech tools
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OUT OF THIN AIR pg. 12
From medicine to mechanical engineering, Waterloo researchers use additive manufacturing to print the parts they need to succeed
Christian Aagaard

HARDWARE REVOLUTION pg. 18
Waterloo alumni are leading a new manufacturing wave — where high-tech meets hands-on
Beth Gallagher

TEAM SPIRIT pg. 24
While other schools may fill stadiums and paint faces, team pride at Waterloo is built around more academic pursuits
Elaine Smith

HEALTH WARRIORS pg. 32
From head to toe, see how medical research at Waterloo is improving lives
Heather Bean

ON THE COVER
From left, SUZIE ALEXANDER, PETER HONG, and PAUL REGINATO carry Waterloo’s banner in international competition as leaders of the University’s iGEM synthetic biology team.
PHOTO: JONATHAN BIELASKI
EDITORIAL

Waterloo’s legacy is in your hands

Whether it appears on your résumé, your leather jacket or the degree hanging on your wall, your University of Waterloo affiliation tells the world you’re part of something special. Our lions-and-chevrons shield has become shorthand for academic strength, real-world experience and innovative spirit.

Legacies like this don’t happen overnight. They emerge slowly, over decades, built on people and promises and proof. As a member of the University of Waterloo community, you help define our legacy. And in turn, Waterloo’s legacy helps define you.

We’re about to make that legacy even stronger for the Warriors who follow in your footsteps.

Waterloo’s new Strategic Plan, approved in 2013, promises to see this institution recognized as one of the most innovative universities in the world. We’ll build that reputation on the foundations that make Waterloo such a great university and on the areas of strength that set us apart — our entrepreneurial culture, experience-based learning and world-changing research. Steps are already being taken to make that happen.

Our legacy will grow thanks to world-changing research being carried out by people such as Mihaela Vlasea, BASc ’08, and Ehsan Toosyarkani, PhD ’03 (“Out of Thin Air,” page 12), and the world-class performance of our unconventional student teams (“Team Spirit,” page 24). The endeavours of entrepreneurial alumni including Stephen Lake, BASc ’12 and Matt Rendall, BASc ’08, MBET ’09, (“Hardware Revolution,” page 18) serve as further proof of this institution’s impact.

As part of the University of Waterloo community, you also have an important role to play.

We need you to hire Waterloo. Remember what you learned in your first co-op job? As Waterloo works to expand its Co-operative Education and experiential learning opportunities, we’ll need even more employers to hire Waterloo co-op students. Already part of our employer network? Then make sure your connections hear about the incredible value co-op students bring to the workplace and encourage them to do the same.

We need you to build Waterloo. Be part of the community of support that makes Waterloo better — by acting as a mentor to a startup, an advocate for world-changing research, a donor to new projects and programs or a flag-bearer within your personal and professional circles.

We need you to live Waterloo. Whether working for themselves, for someone else or for the betterment of society, Warriors like you have a unique ability to identify problems, envision solutions and make them a reality. Being entrepreneurial isn’t about making money — it’s about making a difference. Let people know that’s the Waterloo way — and that you’re a proud member of the black and gold family. Proof of our success resides in the worldwide impact of research that changes lives, students who transform workplaces, faculty who inspire young minds, staff who make it possible, and the alumni who carry our banner into the world.

Set your inner Warrior free. Our legacy is in your hands.

STACEY ASH, Editor

WEB see Editorial at uwaterloo.ca/alumni/links
Creating the conditions for success

Jack Welch, former CEO of General Electric and a globally respected business thinker, is the source of innumerable pearls of wisdom. Here’s my favourite: “If the rate of change on the outside exceeds the rate of change on the inside, the end is near.”

It’s as true for academic institutions as it is for businesses, non-profits, governments, and communities: to succeed, you need to be highly adaptive to your environment.

But in fact, that only gets us halfway there. It ignores the possibility of not only adapting to one’s environment, but of actively shaping it to be as supportive as possible to one’s own mission, strengths, and interests.

The University of Waterloo is actively engaged on both ends of this strategy.

Our Strategic Plan — available with great supporting materials at uwaterloo.ca/strategic-plan — represents a complete retooling of our organization for success going forward. Our mission to be recognized as one of the world’s top innovation universities is crystal clear. And we’re embedding processes and priorities deeply throughout the university to make that happen.

Our plans for 2014 include major boosts to co-operative education as well as entrepreneurship and commercialization activities at the university. These areas, along with research, internationalization and our other core Strategic Plan themes, are vital to our reputation and relevance both at home and abroad.

But what does ‘abroad’ look like? What is the nature of the global post-secondary education environment?

As a global sector, it is very much still in development. Its governing regime of norms and rules is only beginning to emerge, which is exactly why Waterloo — and Canada’s universities more broadly — need to be at the table.

We need to ensure the environment develops in a way that is good for Canada’s universities.

So we’re taking concrete action.

On behalf of Canada’s U15 grouping of research-intensive universities, which I serve as vice-chair, I was honoured to negotiate the group’s inclusion in the Global Network earlier this year. The Global Network is a global scale “meta network” of national research-intensive university networks organized by country.

Participating in the Network gives us an equal seat at the table with research-intensive university groups from the U.S., China, Britain, Europe, and Australia. In this way, Canada’s universities are helping to shape the contours of the global post-secondary education environment, with tangible benefits to Canadian institutions.

This group will help inform international research funding policy, work toward basic consistency across jurisdictions in terms of defining the role and scope of research universities, and close compatibility gaps between national research-intensive university networks.

We can only begin to conceive of the expanded opportunities for our students, faculty, and staff who will emerge from this and from related efforts that we’ll continue to make going forward.

The University of Waterloo is an institution on the rise, but we can’t do it alone. We need to organize ourselves for strategic success at the institutional level, while showing strong leadership within Canada and ultimately helping to shape the international environment to be as friendly and accessible as possible to our strategic goals.

We’re not just changing fast, we’re changing smart. Even Jack could get behind that.

FERIDUN HAMDULLAPUR

WEB see President’s Message at uwaterloo.ca/alumni/links
Bidding adieu to ACE Camp

The broader university community is probably not aware of the death of the Faculty of Arts’ ACE Camp (Arts Computer Experience) program this year.

ACE Camp, led by Program Co-ordinator Marsha Wendell, acted as an exciting and stimulating summer camp for kids from six years to teen. The camp ran on-campus for the last 30 years.

Marsha retires this year. Her retirement, along with construction and renovations planned by the Faculty of Arts, have put an end to this long-running program which benefited so many children in Waterloo.

Thanks, Marsha — we’re sorry to see this great program come to a close.

RON PFEIFLE, BMath ’87, MMath ’89
Waterloo, Ontario

Excessive focus on entrepreneurs

I am writing to you concerning the inordinate focus that the alumni magazine places on entrepreneurs. Most issues of the magazine have one or more articles highlighting entrepreneurs. While I realize that entrepreneurs have a role to play in providing new business ventures, I expect that they are a small portion of Waterloo graduates.

What about the majority of graduates that get a degree, go out in the workforce, provide much-needed services to their employers, raise their families and contribute to the welfare of their communities? These people, and not entrepreneurs, are the backbone of society and deserve recognition for their contribution.

Not everyone has the desire to be an entrepreneur nor should they. Whatever happened to learning for learning’s sake? An educated society is more than an assembly line to feed the insatiable demands of business.

RICHARD MILLER, BSc ’68, BIS ’00

Equinox Summit recommendations mirror Montessori approach

I read the conclusions of the Equinox Summit with interest.

No grades, no exams and mixed-age classrooms.

Sounds like Montessori education, which starts as early as infancy rather than waiting for high school. No need to reinvent the wheel: this already exists. Will Wright, Larry Page, Sergey Brin, Jeff Bezos, Peter Drucker, Jimmy Wales and Dr. T. Barry Brazelton are among the many people who have been educated with this method in the past 107 years.

JESSICA MIKLOS, BIS ’00
Montessori Guide
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“I would definitely recommend the certificate programs to others. There is a lot of good theory and the courses are practical...

I can’t say enough about the networking opportunities that resulted as well.”

KEVIN MENDOZA
BASc '99

I would definitely recommend the certificate programs to others. There is a lot of good theory and the courses are practical...

I can’t say enough about the networking opportunities that resulted as well.”

KEVIN MENDOZA
BASc '99
Canadian gold medallist and motivational speaker **Adam Kreek** shared his achievements as an Olympic rower and how his failed quest to row across the ocean led to great success. The following is an excerpt from his lecture at the Leadership Starts Here Conference held on Waterloo’s campus.

**HEARD ON CAMPUS**

Find success through failure

**I seek failure.** The only and fastest way that we grow is if we grow along the edge of our comfort zone. But the only way we know the true edge of our comfort zone is if we part from failure once in a while …. It’s risky to find that failure but you figure out what motivates you and you figure out your true limit … .

It’s the strength to continue that counts. The concept of reflecting, learning, growing, and letting go … so it’s not baggage anymore — it’s something that makes you stronger.

It doesn’t matter that I was abused as a kid. It doesn’t matter that I failed that test. It doesn’t matter that the relationship failed. I learned from it and now I’m better. It’s a part of me and it’s who I am. …

I had a new goal after going to the Olympics. I met this guy down in San Francisco who rowed across the ocean … and that sounded like something I wanted to do. It was adventurous. People say “Why would you want to do that?” My answer is, “It is natural.” This part of your brain lights up when you think of doing something new and it can inspire us to do great things. We want to try something new because we think that there will be something beautiful we can discover in the process …

Recognize that it takes a bunch of small goals, small steps, and small actions to the bigger goal …. The hardest part of rowing across the ocean wasn’t rowing across the ocean itself, but raising half a million dollars and building an organization that could support it. It wasn’t easy. I quit a couple of times … The thing that kept me going as we built towards this final goal was “look how far we’ve come.”

That was also very important when I was actually rowing across the ocean. We hit this wave the size of the room and it peaked over and crashed on the top of our boat … When we sat in the life-raft before we got rescued, we said “You know what? We failed. Is there an opportunity in this? We just need to figure out what it is.” It turns out that when four guys are in the middle of the ocean, almost dying but being rescued makes really good news. And so I think it’s important through failure we win.

I think the final key I want you to take from this is: No one ever sat on the start line of the Olympics believing that they weren’t going to win, and then won the Olympics … It’s important to recognize that you are worthy. If you have put in the work, if you have focused on what you can control and done everything in your power to get to where you are, you are worthy. You can give it your all and what happens is just going to happen. You are going to keep moving on and keep progressing.

WEB see Heard on Campus at uwaterloo.ca/alumni/links
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uwaterloo.ca/support/planned-giving
New Doctor of Pharmacy degree launches

The University of Waterloo launched its new and innovative Doctor of Pharmacy program in January, giving future pharmacists even more opportunities to meet Ontario’s modern health-care needs. PharmD replaces the previous entry-to-practice degree. It provides students with advanced clinical training to closely align with the recently expanded scope of practice for pharmacists across Canada, and prepares them for the direct-patient-care roles of today’s practitioners.

WEB see Pharmacy at uwaterloo.ca/alumni/links

Waterloo acquires BlackBerry buildings

Waterloo purchased five BlackBerry buildings at the corner of Phillip and Columbia streets for $41 million in February. “We are growing, and the opportunity to purchase buildings so close to campus allows us to meet current space challenges that will help us better meet the needs of the campus community,” said Professor Feridun Hamdullahpur, president and vice-chancellor of Waterloo. Plans are in progress to determine what programs or services would be allocated to the new space.

WEB see BlackBerry at uwaterloo.ca/alumni/links

REGISTRAR
KEN LAVIGNE
RETIRES

Many said farewell and congratulations to Ken Lavigne, who had been the University of Waterloo’s registrar since 1996, as he retired in January. Lavigne had been heard saying that he “bleeds black and gold” from his years of service to the University. During Lavigne’s time as registrar, first-year intake doubled and the undergraduate student population expanded from about 19,000 in 1997, to more than 31,000 in 2013.

WEB see Registrar at uwaterloo.ca/alumni/links
FORBES 30 UNDER 30 LIST FEATURES THREE WATERLOO ENTREPRENEURS

In January, Forbes magazine named Waterloo’s Eric Migicovsky, Ted Livingston, and Douglas Lusted to its Forbes 30 Under 30 list. Migicovsky launched the most successful Kickstarter project of all time with his Pebble smart watch, raising more than $10 million in just 38 days. Livingston co-founded Kik Interactive Inc., an innovative smartphone messenger service that has grown to 100 million registered users. Lusted launched WestonExpressions, a corporation providing hardware and software innovations for the advertising industry. He also developed the Linkett Interactive Digital Signage System.

WEB see Entrepreneurs at uwaterloo.ca/alumni/links

Grebel celebrates 50th anniversary with Bruce Cockburn concert

Canadian music icon Bruce Cockburn played a solo concert at the University of Waterloo campus in February as part of Conrad Grebel University College’s 50th anniversary celebrations. “His music has always been popular with students and alumni,” said Fred Martin, director of development at Grebel. Founded in 1963 by Ontario Mennonites, Conrad Grebel University College is a Christian liberal-arts college affiliated with the University of Waterloo. Grebel is home to an innovative music department that focuses on the way music intersects with students’ daily lives and courses.

WEB see Anniversary at uwaterloo.ca/alumni/links
STUDENTS AND ALUMNI COMPETE IN SOCHI GAMES

Waterloo students and alumni proved they are among the best in the world as they competed in the Sochi Olympics in February. Heather Moyse, a Waterloo alumna, won gold for the second time in the two-man bobsleigh event. Andrew Poje and Kaitlyn Weaver competed in the ice dance event, and Daria Gaiazova finished fifth place in the team and individual cross-country skiing. At the Paralympic Games, Melanie Schwartz competed in alpine skiing, and Greg Westlake in team sledge hockey. Congratulations from across Waterloo's campuses went out to the Olympians.

WEB see Sochi Warriors at uwaterloo.ca/alumni/links

Humans of UWaterloo page sparks thousands of likes

A Facebook page that launched in February reached more than 2,000 likes within three days. Created by two first-year Arts and Business students, Danielle Bennett and Cindy Chau, the page is based on the popular Humans of New York project. The page posts pictures with information captions of students, faculty and staff they meet around campus. Humans of UWaterloo went viral among Waterloo students perhaps because it helps people learn more about each other and displays campus diversity.

WEB see People of Waterloo at uwaterloo.ca/alumni/links
New quantum materials lab opens

A world-class laboratory that could lead to the creation of quantum materials for new technologies opened at Waterloo’s Institute for Quantum Computing in December. The David Cory Lab houses a unique $5-million tool that grows high-quality, thin films used in electronics ranging from computer chips to micro sensors. “Professor Cory’s new lab builds on our international presence for research excellence, and we expect that the results will be an important step in building a pathway to the quantum world,” said Professor Feridun Hamdullahpur, president and vice-chancellor of Waterloo.

AWARDS AND HONOURS

» Adrian Gerlich, a professor in the Department of Mechanical and Mechatronics Engineering, was named the NSERC/TransCanada Industrial Research Chair in Welding and Energy Infrastructure.

» John Honek, professor and chair of the Department of Chemistry, was awarded the 2014 Bernard Belleau Award from the Canadian Society for Chemistry in honour of his contribution to medicinal chemistry.

» Four Environment researchers were awarded The Dr. John R. Evans Fund from the Canadian Foundation for Innovation. A total of $167,500 in project funding was received by:
  Jennifer Clapp
  Brad Fedy
  Peter Johnson
  Derek Robinson

» Jean-Philippe MacLean, a master’s student in the Department of Physics and Astronomy, received the André Hamer Postgraduate Award from the Natural Sciences and Engineering Research Council of Canada.

» Zhou Wang, a professor and researcher in the Faculty of Engineering was awarded the E.W.R. Staecie Memorial Fellowship from the Natural Sciences and Engineering Research Council of Canada.

» Dmitry Abanin, a physicist and associate professor at Waterloo’s Institute for Quantum Computing received a Sloan Research Fellowship from the Alfred P. Sloan Foundation.

» Rob de Loë, a professor of environment and resource studies in the Faculty of Environment, was appointed co-chair of the Great Lakes Water Quality Board on The International Joint Commission.

» Kevin Resch and Roger Melko from Waterloo’s Department of Physics and Astronomy were named Tier 2 Canada Research Chairs. Resch holds the Canada Research Chair in Optical Quantum Technologies and Melko holds the Canada Research Chair in Computational Quantum Many-Body Physics.

» The University of Waterloo’s Engineering Science Quest (ESQ) outreach program was awarded the Actua & GE Canada Award for Leadership and innovation in science and technology. The summer camp was recognized for its dedication to high-impact, quality programs, ongoing leadership and supportive engagement of Canada’s most underserved youth.

» John McPhee, a professor of systems design engineering in the Faculty of Engineering, was awarded the Synergy Award for Innovation from the Natural Sciences and Engineering Research Council of Canada. The $200,000 award recognized his auto research work in collaboration with Maplesoft and Toyota Motor Manufacturing Canada.

» Four Waterloo startups received $25,000 each in grants from Kik Interactive founder and former Velocity resident, Ted Livingston:
  Light-bot
  MetricWire
  PiinPoint
  uMentioned
out of THIN A
From human health to architecture, 3D printers help innovative ideas take shape

Mihaela Vlasea might have headed off to medical school after earning her Bachelor of Science degree at the University of Waterloo.

Instead, she chose to stay to push three-dimensional (3D) printing into new territory: Bone replacements that have the porosity and function of the real thing.

For thousands of Canadians facing surgery to deal with the pain of faulty joints, this holds the possibility of improved, lasting remedies.

"I could see where my technique would have an impact right away," Vlasea says.

Researchers prefer the term "additive manufacturing" to describe any one of several processes that produce three-dimensional objects by fusing together material one tiny layer or strand at a time. Heat and organic or inorganic binders can all play a role in the process.

Focused light, often in the form of lasers, offers one source. Vlasea's work involves ultraviolet light, an inorganic binder, and a compound called calcium polyphosphate.

Although it has been around for almost 27 years, additive manufacturing has only recently — over the last five years — drawn wide, wonderstruck attention in and out of the academic community.

Machines have become smaller, smarter and cheaper. The materials they currently use range across different types of metals, plastics and ceramics.

Researchers have stopped wondering whether they will ever make organs and other body parts using live cells as media.

Now, they ask, how well can they do it? Functional organs are just around the corner. »

« Mihaela Vlasea and Farid Behzadian work to create bone replacements that function like the real thing.
Although 3D printers differ in method, they have at least one thing in common: They like to read. Nothing gets done without somebody creating a computer-aided design (CAD) file that lays out the dimensions and features of the product.

“We’re getting some fantastic physical properties out of additive manufacturing,” says Ehsan Toyserkani, who runs Waterloo’s Multi-Scale Additive Manufacturing Laboratory (MSAM) located in Engineering 3. “The mechanical strength we are getting is much better — in some cases as much as 25 per cent improvement — over conventional manufacturing.”

Toyserkani’s lab, where Vlasea does much of her research, spins off patentable developments in additive manufacturing. By exploring “micro-scale additive manufacturing,” it has found a way to embed sensors into metallic objects as they are being printed. Waterloo researchers also developed a means of monitoring and sensing the process zone in laser direct metal fabrication, one form of 3D printing, to improve its repeatability, accuracy and reliability.

“At the moment, we have been recognized as the first university in Canada doing extensive research and development in additive manufacturing. Waterloo hopes to enable the next generation of additive manufacturing processes and advance the existing technologies for numerous applications through a holistic approach. Several universities, coast-to-coast, have recently started working on this area, so we expect to see multiple national collaborative projects,” says Toyserkani, an associate professor in the Department of Mechanical and Mechatronics Engineering in the Faculty of Engineering.

**Plastic prototyping: Manifold destiny**

Across Waterloo’s campuses, additive manufacturing has moved from the fringes of learning to the mainstream.

Toyserkani’s research team works with five machines it built from scratch or bought and modified. His team experiments with materials and methods in the emerging field of bioengineering. Vlasea’s work over four years earned her a doctorate at the end of January.

Elsewhere on campus, a group of students last year used laser sintering, a form of 3D printing, to fuse chocolate into three-dimensional objects.

But most of the additive manufacturing happening at Waterloo turns out parts and prototypes made of plastic.

Quick and inexpensive, a 3D-printing process known as fused deposition modelling offers students and faculty a means of rapidly giving shape to ideas rattling around in their heads.

“We’re able to design something in the evening and try it the next day,” says Thomas Abdallah, a second-year mechanical engineering student on the University of Waterloo Alternative Fuels Team. “Now we’re at the point where we can print iterations and have them work really well.”

The team printed an air-intake manifold to squeeze into the snug engine compartment of its modified car.

Fused deposition modelling lays down filaments of heated plastic. Objects take shape over several hours or days, depending on complexity.

Still, it’s faster and cheaper than having a machine shop make a prototype in metal. Additive manufacturing takes some of the risk out of prototyping.

Men and women living in the Velocity Residence for student entrepreneurs don’t have to travel far to work out an idea in three dimensions. They can build prototypes on an in-house MakerBot printer, which uses fused deposition modelling. MakerBots are small enough for home use.

At the School of Architecture, in Cambridge, students have access to a MakerBot and a larger fused deposition printer.

“They’ll use 3D printing to solve design issues,” says Heinz Koller, manager of the school’s fabrication laboratory. “It’s often more
Out of thin air

THOMAS ABDALLAH, a member of the University of Waterloo Alternative Fuels Team, uses 3D printing to produce plastic parts and prototypes.

effective to hand somebody a 3D model, as opposed to trying to explain a 2D sketch.”

One event more than any other widened the eyes of the Waterloo community to the potential of additive manufacturing.

In February 2013, the Sedra Student Design Centre in Engineering 5 formally opened its 3D Print Centre to introduce its star tenant — a Fortus 360mc printer.

A display case at the centre contains chess pieces, an IronMan mask and tools with moving parts — made of plastic by fused deposition in the Fortus. Available to all Waterloo students and faculty, the printer often runs around the clock to meet demand.

Additive manufacturing helps drive inventiveness, says Peter Teertstra, director of the Student Design Centre.

“It affects the way you design,” he says. “On paper, you can never completely visualize all the parts to see how they fit.”

Now students can spot flaws in function and quickly try again, he says.

HOW IS WATERLOO USING 3D PRINTING?

FOR RESEARCH AND DEVELOPMENT:
Porosity is a golden word in the Multi-Scale Additive Manufacturing Laboratory. Researchers use additive manufacturing to develop such things as bone and dental implants that closely match the real ones in form and function.

FOR PARTS AND PROTOTYPING:
A large 3D printer in Engineering 5 often runs around the clock, turning ideas that students and faculty have dreamed up into tangible plastic objects. Besides prototypes, output from the centre includes working parts that might end up in a robot rover or alternative-fuels vehicle.

TO TEACH DESIGN:
Additive manufacturing helps students at Waterloo’s School of Architecture, in Cambridge, experiment with shape. Shapes that don’t appear to work on paper sometimes do when they’re printed in 3D. Students can also test their ideas by printing plastic models of buildings and streetscapes.

TO SOLVE PROBLEMS:
Voltera Inc., a startup based in Waterloo’s Velocity Garage, uses conductive ink to make inexpensive, rigid circuit boards — without the toxicity of conventional, chemical-based processes. Device-makers can try different iterations of a circuit board without going broke. Although not 3D printing in the usual sense, it is rapid prototyping, and it is meant to be a desktop tool.
Printed plastic parts are often strong enough to replace machined-metal components. A.J. Rosewarne, president of Waterloo's robotics team, says printing shaved off a month's work as the team heads to competition this spring.

Competition teams and engineering students putting together fourth-year projects aren’t the only users of the Fortus. Teertstra says he's impressed by the level of innovation and entrepreneurship students in other programs show when they come to the print centre.

Clients usually meet with Genie Kim. A first-year mechatronics student, Kim helps students refine their CAD files and choose their plastics. The print centre is her co-op placement.

"It's that trial-and-error part, and that interaction with customers, that makes this job a lot of fun," Kim says.

Besides turning out parts and prototypes for projects, students book time on the printer for incidental items.

One student learned enough about CAD files to print a replacement plug for a cellphone charger. Others made hearts for Valentine's Day.

The Fortus arrived in the print centre thanks to a Waterloo partnership with two leaders in the 3D-printing business, Cimetrix Solutions and Stratasys Ltd. The print centre installed the unit for $100,000 — the amount it received as a grant from the DENSO North America Foundation.

It also has a relationship the Hyphen division of Christie Digital Systems Canada Inc., a company based in Kitchener. Students get reduced-cost access to Hyphen's expertise and equipment in additive manufacturing.

"Anything they can't do, we can probably do for them," says Mark Barfoot, Hyphen's managing director. Barfoot is a Waterloo mechanical engineering graduate ('98).

**Better joints, one step at a time**

Ehsan Toyserkani keeps a collection of items to demonstrate what additive manufacturing can do. The collection includes a manufactured vertebra and a tooth, and a small graceful sail made of metal — all printed by machines in the MSAM lab down the hall from his office.
Doctoral candidate Ahmad Basalah works with titanium to 3D print porous scaffolds for rebuilding tissue.

“My ultimate goal is to build a whole porous knee replacement” he says.

A better dental implant might be the outcome of the research Farid Behzadian, a master’s student, does at the lab.

Recently graduated and exploring her options in 2008, Vlasea took up an invitation from Toyserkani to check into a project run by the University of Toronto and Mount Sinai Hospital. The University of Guelph, McMaster University and Queen’s University in Kingston are also partners.

Vlasea used her background in engineering to build a 3D printer that makes skeletal parts with remarkable bone-like features, from a porous surface to nutrient-carrying tubes and channels inside.

Using ultraviolet light and a binding agent, the process fuses powdered calcium polyphosphate into a biodegradable scaffold with intricate internal porous features. The aim is to have bone cells migrate into the implanted scaffold, the way coral forms on a shipwreck.

As the cells replace the compound, a natural, better-fitting part takes shape. So far, testing has been limited to animals.

Researchers also want cartilage cells to latch onto the surface, creating a more compatible interface between the manufactured joint and the natural bone and cartilage that surrounds it.

Conventional joint replacements using plastics, metals and ceramics relieve pain and restore mobility, but they don’t work forever. Hip replacements typically last 10-15 years, according to the Canadian Joint Replacement Registry.

Each tweak of her process, each new part the printer turns out, moves Vlasea closer to scaffolds that more precisely mimic natural bone.

“I am very happy about how things turned out because of three reasons,” Vlasea says. “I got to work with an amazing interdisciplinary group. I am now involved in the additive manufacturing wave that is sweeping technology across a multitude of sectors. I got to use my engineering skills to build a 3D-printing machine.”

“How cool is that?”

WHERE IS 3D PRINTING TAKING US?

Three-dimensional printers are now small enough to sit on a desk, but does that mean everybody will want one?

Mark Barfoot has his doubts. The managing director of Hyphen, a Kitchener-based service that offers businesses — and University of Waterloo students — its expertise in 3D printing, Barfoot sees another scenario: The neighbourhood print shop.

“That’s more the model that I would see, where someone would go to a service place,” he says. “They bring in their part and somebody either scans it, or models it for them, and prints it.”

But, he says, there is no question 3D printing — additive manufacturing as it also known — creates opportunities while it changes the way things are developed and manufactured.

Not that long ago, the talk about 3D printing focused on what it could do for rapid prototyping, Barfoot says. Now, with the wide range of materials it can use — and the precision it delivers — additive manufacturing is seen as the answer to low-run production needs.

Ehsan Toyserkani, the University of Waterloo professor in charge of the Multi-Scale Additive Manufacturing Laboratory in Engineering 5, sees additive manufacturing as complementing conventional mass production or filling niches that mass production misses.

Additive manufacturing enjoys advantages, he says, in its ability to cut the cost of prototyping, make complex objects that can’t be stamped or cast, and reduce energy waste.

In “Disruptive manufacturing: The effects of 3D printing,” Deloitte LLP consultant Benjamin Grynol writes “3D printing will potentially have a greater impact on the world over the next 20 years than all of the innovations from the Industrial Revolution combined.”

Industries that overlook additive manufacturing, Grynol contends, will face competition not only from more-adaptive companies but from inventive consumers using the technology at home or elsewhere. New business opportunities will surface as 3D printing becomes more accessible, he adds.

“How cool is that?”
HARDWARE

Manufacturing the future, from wearable technology to high-tech tools
Long before Clearpath Robotics was a multi-million dollar operation with a global reputation it was a humble Waterloo startup with a space issue. Matt Rendall had a dream of building robots. But almost five years ago — ancient history in the life of a startup — there came a point when his robots would no longer fit under his desk.

For a while, he stored them on top of his desk. When the boxes started spilling into the hallways of the Accelerator Centre, he knew it was time for Clearpath Robotics to move.

"It was starting to become clear that traditional office space didn't mesh with the needs of a hardware startup," says Rendall, CEO of Clearpath Robotics who founded the company with fellow University of Waterloo mechatronics engineering program graduates Bryan Webb, Ryan Gariepy and Pat Martinson. "We were doing our engineering design, sales and marketing in the office during the day," he says. "But at night, after everyone went home, we'd set up in an empty boardroom in the Accelerator Centre. We'd lay newspaper down on the board table and build our robots. We'd set up production lines. We had nine guys crammed into a boardroom that was no more than 200-square-feet.

"We'd work until midnight. Then we'd take a break and play video games. After that, we'd pack everything up and stick it back under our desks."

The Accelerator Centre on the north campus of the University of Waterloo was established to give early-stage companies everything from office space to connections and capital.

It wasn't, however, designed for building robots."
Waterloo mechatronics graduates, including MATT RENDALL, CEO of Clearpath Robotics and AARON GRANT, co-founder of Thalmic Labs are on the leading edge of a Canadian hardware revolution. Clearpath focuses on rugged all-terrain robots, while Thalmic is preparing to ship its motion- and gesture-control armband technology (below).

This year, Clearpath Robotics is moving into a 12,000-square-foot building in Kitchener and doubling its staff while celebrating the sale of its 1,000th robot. At the same time, the University of Waterloo's startup incubator, Velocity, is opening the Foundry, a new workspace that will support entrepreneurs with a passion for hardware.

"Software and hardware startups experience fundamentally different challenges, says Rendall, also a grad of Waterloo's Master of Business, Entrepreneurship and Technology program. "The Foundry is going to provide hardware entrepreneurs with a community of people who share similar challenges. It would have been great to have had that in Clearpath's early days. We could have had a better understanding of the hardware business model and the global manufacturing landscape."

The Foundry will forge a new hardware community

The new 11,000-square-foot Velocity Foundry will open this summer. The Garage program gives Waterloo students and alumni access to funding, free workspace and mentors. While Velocity programs have already supported successful hardware startups, the new Foundry will offer hardware entrepreneurs more space, tools, light-manufacturing machinery and the freedom to make noise.

"At the Foundry, hardware entrepreneurs will be working on physical products so there will be noise," says Mike Kirkup, director of Velocity. "Whether it's the sander or the drill press or an electric motor, these things make noise.

"The only noise software companies make, other than talking, is fingers on keys. It's a very different environment."

The Foundry is the next step for the University of Waterloo in what has already been an impressive list of hardware startups. While the tech media buzzes about a hardware revolution, consumers are flocking to cool new products, such as Thalmic Labs' Myo armband.

Like Clearpath Robotics, all three of Thalmic Labs' co-founders graduated from Waterloo's mechatronics engineering program. As one of the first hardware companies to graduate from the Velocity Garage, Thalmic Labs hit the ground running with its Myo armband, a device that lets you use the electrical activity in your muscles to wirelessly control your computer and phone.
Thalmic, which announced a $14.5-million round of funding last year, plans to start shipping Myo Developer kits in the first half of the year, with final units to follow.

Thalmic co-founder Stephen Lake says the early days of building a hardware startup were challenging. There wasn’t room to build in the Garage at the time, so Mike Kirkup and Communitech CEO Iain Klugman found space in The Tannery building. Lake and his young team set up in an empty room with a couple of lights and a few plugs in the wall.

“We bought some old workbenches and tools off Craigslist, cheap, and we had a 3D printer up there and some electronics assembly and test equipment,” recalls Lake.

“We were one of the early hardware companies that was part of Velocity, but everyone always found ways to help us get what we needed.”

With their shared interests and challenges, hardware entrepreneurs from Waterloo support one another even after they’ve moved on from the early stages of their companies. Just this year, Clearpath Robotics and Thalmic Labs released a video showing how the Myo armband was used to start, stop and drive Clearpath’s Husky Unmanned Ground Vehicle.

Every Waterloo grad with an interest in hardware has a unique path.
CALVIN CHU and ASHISH BIDADI travel broadly, but have based their hardware interface company, Palette, in Waterloo Region.

Mike McCauley co-founded BufferBox with two other Waterloo mechatronics engineering grads, and grew the business in the Velocity incubator. BufferBox, which was purchased by Google in 2012, built kiosks that allowed consumers to pick up online purchases 24/7. More recently, Google announced the division would be merged with other operations in Silicon Valley.

Other alumni established their hardware startups in Silicon Valley. Eric Migicovsky, a graduate of Waterloo Engineering’s system design program, founded Pebble in 2008 and began developing a smart watch that raised $10 million on a Kickstarter campaign. Earlier this year, Pebble announced it sold 400,000 watches in 2013 and expects to double revenue this year.

Another early hardware startup was Aeryon Labs, now a global leader in aerial robotics, or drones, that was founded in 2007 by Waterloo Engineering grads and is based in Waterloo.

The next wave of University of Waterloo hardware startups

Out of the new crop of hardware startups at the Velocity Foundry will be Palette, a company started by two recent mechatronics engineering grads who raised more than $150,000 this year on Kickstarter. Palette sells a hardware interface — a series of knobs, sliders, dials and buttons that snap together like Lego — to work with creative software.

The Palette interface can be customized by users who are tired of awkward mouse-dragging and keyboard shortcuts for editing photos, making movies or creating music. Since graduating last spring, Palette co-founder Calvin Chu has been to San Francisco, Shenzhen, China, and back to San Francisco before returning to Kitchener-Waterloo.

In Shenzhen, Chu and co-founder Ashish Bidadi, were part of HAXLR8R, an incubator devoted to hardware startups. They learned about manufacturing, prototyping and electronics, and roamed electronics markets for the best hardware they could find to build their interface.

“If you can imagine city blocks with huge buildings and each floor has booths with vendors of buttons, knobs, LEDs and sliders,” says Chu. “It was like being in the best candy store of cool stuff in the world.”

But like the founders of Thalmic Labs and BufferBox who went to Silicon Valley to be part of the Y Combinator accelerator, Chu and Bidadi decided to return to Kitchener-Waterloo to build their business.

“Obviously, we want to be close to the talent coming out of the University of Waterloo,” says Chu. “We went through Waterloo ourselves, so we know where they’re coming from.”

Chu says being at Velocity has given the Palette team access to successful startups such as Thalmic Labs, which has an office and production facility in an old factory in downtown Kitchener, not far from Velocity Garage.

Hardware networks are important because entrepreneurs who make a physical product share unique challenges that software startups avoid — from the physical mass of their product to shipping in a global marketplace.

The good news, says Kirkup, is that crowdfunding platforms like Kickstarter are making it easier for hardware entrepreneurs to get funding.
These new platforms are rejuvenating the hardware industry,” says Kirkup. “They are enabling startups to determine whether their ideas actually solve a problem before they spend significant capital and resources to bring it to market.”

Wayne Chang, a Waterloo alumnus who is a lecturer and Enterprise Co-op Coordinator at the University of Waterloo’s Conrad Business, Entrepreneurship and Technology Centre, points out the hardware revolution has also been fuelled by drastically falling prices for electronic parts and components.

An entrepreneur and high-tech engineer for 15 years, seven of which were spent working in Silicon Valley, Chang says these positive changes don’t diminish the reality of the long road ahead for any young hardware entrepreneur. Chang brought in Pebble founder Migicovsky to share his startup journey with students at Conrad.

They were shocked to hear that Migicovsky’s idea was repeatedly rejected by venture capitalists and investors before his persistence paid off.

Long hours and sacrifice are some of the reasons so many young entrepreneurs build their businesses close to the University of Waterloo, with the support of such programs as Engineering Capstone projects, the Velocity Garage and Velocity Foundry.

Chang says it’s notable that so many founders are classmates from the Faculty of Engineering. The startup life is an intense one, says Chang. “You have to really trust everyone on your team,” he says. “They all go through the trenches together at Waterloo. They spend their formative years at the University and find their co-founders here.

“They arrive on campus with that deer-in-the-headlights look. But when they graduate, they know who they can trust as they aspire to create new things. They’re kindred spirits, and that’s why they build companies together.”

WEB see Hardware Revolution at uwaterloo.ca/alumni/links

WATERLOO GRADS ARE IN DEMAND AT GOOGLE[x]

Hands-on hardware expertise sets alumni apart

Google[x] is known as a secretive division of the tech giant that develops everything from robots to self-driving cars. It’s staffed by some of the world’s top innovators — “Peter Pans with PhDs” — who push hardware technology to the bounds of science fiction.

But for University of Waterloo alumnus Rahim Pradhan, the road to Google[x] was more hard work than magic. A graduate of Waterloo’s mechatronics engineering program, Pradhan got started in hardware in the University’s machine shop during his first co-op job.

The machine shop supervisor was so impressed with Pradhan’s work, he wrote him a reference letter.

“At the time, I didn’t think much of it,” says Pradhan. “But, believe it or not, I actually gave that reference letter to Google when I was interviewing with them.

“I learned how to use everything from milling machines to lathes in the shop. I basically learned how things are made. You can have all these great ideas, but you need to be able to build them. That’s why that first co-op job was so great.”

Pradhan works in Silicon Valley within the Google[x] group developing the driverless car. He works alongside other engineers dedicated to Google Glass, the augmented-reality glasses. Google[x] also has teams researching how balloons in space could be used to give developing nations internet access, smart contact lenses and new approaches to wind power.

“We want people who can translate ideas into actual products — people who want to launch fast and are not afraid to fail,” says Alice Cheung, a Google[x] recruiter. “We want people who have done startups and who have been playing with things for a really long time.”

As innovation moves into the hardware space, Google[x] recruiters are looking north for students, like Pradhan, who have hands-on experience.

“Anything physical at this point is really interesting to us,” says Cheung. “People have the idea that Google[x] is a secret research lab, but it’s actually a really rapid-prototyping hardware lab.

“The fantastic thing about the University of Waterloo is the calibre of candidates. They have so much hands-on work experience. The co-op program is a brilliant idea. I wish more universities did something like that.”

Meggie Smith, a Google[x] recruiter who works with Waterloo students and alumni, says she’s competing with other companies to get the top talent coming out of Waterloo to help drive the hardware revolution.

Google has a reputation for perks such as free food, yoga classes and rock-climbing walls. But it’s working on cool, high-impact technology that should spark the interest of potential recruits.

For Pradhan, a committed hardware engineer, Google[x] has given him the opportunity to follow his passion and work with “really smart people.”

“We’ve seen what software can do,” he says. “The software is there. Now we’re asking, ‘How do we move the hardware forward?’ Hardware is the next step forward and Google[x] is all about projects that make contact with the physical world.”
Academic teams at Waterloo come in all shapes and sizes. They cross disciplines and faculties, work long hours and learn to do by doing. These photos show just some of the remarkable teams representing Waterloo on the national and international stage.
At Waterloo, top competitors rely on brains over brawn

It began as an idea and snowballed into a full-on rush for knowledge and experience.

Four University of Waterloo students and an alumnus banded together in 2013 for a run at the 2014 Hult Prize, a U.S.-based social entrepreneurship competition that seeks the best idea for solving a global social issue. It also comes with $1 million in seed funding for the winning student startup.

Mustafa Kurdi, a graduating pharmacy student, had heard about the competition from a friend. He was intrigued.

Using his personal network and Facebook, Kurdi built a team of members with diverse skills and varied backgrounds: alumnus Sajjad Kamal, a mathematics graduate living in Dubai; Zeina Makki, a mechatronics engineering student with Red Cross volunteer experience; Dr. Femi Giwa, a Nigerian physician in the Master of Business, Entrepreneurship and Technology program; and Abdullah Zubair, a software engineer and engineering management graduate student. »
“Our team members have a lot of different personal experiences, but we all value other people and giving back to them,” Kurdi said. “That’s what drives us first and foremost.”

While other schools may fill stadiums and paint faces, true team pride at Waterloo is built around competitions where brain matters more than brawn.

Student design teams, robotics teams, computing teams, hacking teams, and accounting teams all compete for Waterloo on the international stage.

There’s more than gridiron glory on the line for these intellectual athletes: Cash prizes, scholarships, résumé-boosting awards and even prime jobs are the payoff.

The Hult competition was created in partnership with former U.S. President Bill Clinton and The Clinton Foundation. This year, it called on teams to find a way to deal with non-communicable diseases in urban slums.

Kurdi’s team worked for three months before pitching a proposal at the Hult regional competition in Dubai, on March 7-8. Team members raised some of their own money for the trip.

They met weekly via Skype and sought guidance from Hari Stirbet of the Waterloo School of Environment, Enterprise and Development. Their proposal involved raising revenue from organic waste collection to offset health-care costs in slums.

While it didn’t come home with a win, the team was able to “raise awareness about what Waterloo students are capable of doing,” Kurdi said.

Away from stadium lights and packed grandstands, academic teams work unobtrusively and compete with few spectators in attendance.

In 2013, the iGEM (International Genetically Engineered Machines) team quietly achieved Waterloo’s first gold medal at the synthetic biology competition, something competitors Yale and MIT couldn’t claim.

This year, thanks to strong case work, three teams from the School of Accounting and Finance went to the nationals of the National Investment Banking Competition in Vancouver. They were among 25 finalists drawn from a pool of 250.

One Waterloo team finished in the top three.

An international presence

Students often win more than medals: Some competitions offer cash prizes ranging from hundreds to thousands of dollars. In January, a team from the School of Accounting and Finance won the 2014 CA$H competition run by CPA Ontario, and took home a $3,000 prize.

At Waterloo’s School of Architecture, Team 420 won the 2013 Evolve Sustainable Design Competition, sponsored by RBC and B+H Architects. The team won $5,000.

Academic challenges pit Waterloo students against top schools around the world, earning key résumé points for themselves — and bragging rights for the University.

Examples abound: Waterloo engineering and computer science students defeated teams from Harvard, Duke, Cornell, MIT and the University of California-Berkeley in winning Facebook’s 2012 College Hackathon.

At the International Student Competition on Cold-Formed Steel Design in December 2013, Colin Van Niejenhuis, a master’s student in civil engineering, bested competitors from universities as far away as China and Thailand, as well as engineering students from Virginia Tech, a U.S. engineering powerhouse, with his second-place finish.

Academic team culture at Waterloo is getting stronger by the year.

The Sedra Student Design Centre, home to nine engineering-focused teams when it opened three years ago, now houses more than 25 academic teams.

Engineering students design and build such experimental competition vehicles as robot rovers and solar cars, while the Aquaponics Design Team studies, designs and constructs...
Waterloo teams compete in some high-level competitions, including:

- Canadian Open Data Experience
- CASH Competition (Chartered Professional Accountants)
- Chartered Financial Analyst (CFA) Investment Research Competition
- National Investment Banking Competition
- Hult Prize
- RBC Next Great Innovator Challenge
- Case Evaluation Society Case Competition
- Rice Business Plan Competition

**UPCOMING COMPETITIONS**

**UW Robotics Team**
- University Rover Challenge, May 29, Utah, Mars Desert Research Station
- NASA Sample Retrieval Robot Challenge 2014, June 6 – 9
- Formula Motorsports
  - Formula SAE Michigan, May 14 – 18
  - Formula North Barrie, May 22 – 25
  - Formula SAE Lincoln, June 18 – 22
- Waterloo Rocketry
  - Experimental Sounding Rocket Association (ESRA), annual Intercollegiate Rocket Engineering Competitions, June, Green River, UT
- UW Alternative Fuels Team
  - EcoCar2, June 1 – 12, Milford, Michigan, and Washington, D.C.
- UW DNA
  - BIOMOD 2014, November 1, Harvard University in Cambridge, MA

Water-based systems to promote sustainable food production.

The concrete toboggan team has won the Great Northern Concrete Toboggan Race four times during the past 15 years — more than any other team.

“The teams embody the enthusiasm, energy and excitement of learning, and doing new things through experiential learning,” said Peter Teerstra, director of the Sedra Centre. “They demonstrate all those things we’d like our students to aspire to.”

Lessons learned from competition give students an edge in the job market, said Craig Geoffrey, a lecturer in finance who serves as advisor to a number of student teams.

Geoffrey said participation in competitions builds confidence, making students more comfortable with industry professionals they meet at events.

“There is so much competition for jobs in finance, and there can’t be that much difference among the top students,” he said. “The differentiating factor is often your ability to network, and if you’re good at that, it’s a distinct advantage.”

Challenges also offer students an opportunity to road-test lessons learned in the classroom.

“It has been a tremendous way to take the knowledge we get in school and apply it in a competitive setting,” said Joanne Toporowski, a recent honours Math/CPA program graduate; and Michael Wang, a recent accounting and financial management student; Sunny Guo, a recent Math/CPA program graduate — took on the role of investment research analysts and determined Loblaw Companies Ltd. to be a sound investment.

The team advanced to the Ontario final in Toronto February 10.

“The best part of teamwork is that everyone has a unique personality and a unique skill set,” said Wang. “That added a lot of value. I enjoyed working with people with different knowledge and a different way of thinking.”

Win or lose, team members agreed, time applied to competition is time well-spent.

“Sometimes, the feedback is the most important part,” said Toporowski. “If you hear what your flaws are, that’s where real personal progress can be made.”

One competition challenges students to broaden what the world knows about the cellular building blocks of life. And Waterloo happens to be very good at it.

**Elite competition**

Its iGEM team competes in the international arena of synthetic biology. Team advisor Trevor Charles, associate chair of biology in the Faculty of Science, describes it as “using engineering principles and applying them to biology to see if you can design an organism to carry out certain tasks.

“For example, a bacterial strain that can solve math problems, or one that is able to attack a cancer cell. It opens your eyes to how you can apply quantitative methods to the life sciences.”

The international iGEM competition began at the Massachusetts Institute of Technology (MIT) 10 years ago. Waterloo’s iGEM team started as a joint initiative with the University of Toronto, but has been flying solo since 2007.

Each iGEM team chooses its project for the year. In 2013, Paul Reginato, a graduating Waterloo team member, came up with a basic research idea based on a paper he had read: Improve cell-to-cell communication by developing better DNA messaging.

Reginato’s work gained attention from a number of prestigious universities, such as Stanford and Berkeley, which courted him to pursue his PhD there. He recently decided upon a PhD in biological engineering at MIT, where
his tuition and health care will be paid, and he’ll receive a stipend.

“Even though the connections didn’t come directly through iGEM, iGEM was the key opportunity that facilitated my growth into an attractive PhD applicant to these top institutions,” said Reginato.

One difference between a sports competition and iGEM is the emphasis on collaboration between different teams. Teams get additional marks for working together.

The Waterloo team drew on expertise from the University of Ottawa to complete its project. Part of the challenge is creating new “BioBricks” — DNA parts — that can be shared with future teams.

“Science is all about sharing what you do,” said Suzie Alexander, a third-year biomedical science major and veteran of iGEM’s gold-medal squad. “When we worked with Ottawa, we had another network to tap into and more knowledge at our fingertips. Even though there is a big sense of competition, there’s also a big sense of collaboration.”

For the 2014 competition, Waterloo’s iGEM students have chosen to focus on combating antibiotic resistance in microbes, an applied research project. During the 2013 competition, they realized that many of the most popular projects were application-based, said Julia Manalil, a team veteran and lab leader. Team members are also eager to design a project that will contribute to society. For 2014, they have decided to look for a way to stop MRSA (Methicillin-resistant Staphylococcus aureus), an antibiotic-resistant bacteria that poses a major hospital-care threat.

“We hope to use this system as a basis for future models for fighting antibiotic resistances in other organisms,” said Alexander. “And we hope we can change the future of health care.”

For iGEM, most of the research is done during the summer, since “opening day” at the competition takes place in the fall.

Judges for the final round select a winner based on such factors as the overall excellence of the project, presentation (including a poster) and social impact. Waterloo has moved on to the international final twice in the three years it has been held. Since first entering the competition as a separate team in 2007, the iGEM team has achieved medal standing in all competitions but one.

“At the (2013) awards ceremony, getting the gold standing, Best Scientific Poster Award and going on to the finals at MIT was more than we could have asked for,” said Hina Bandukwala, a recent graduate and member of the 2013 team. “We were ecstatic. The situation was surreal.”

In the beginning, anyone with the appropriate skills — biological, engineering, mathematical modelling or in outreach — could join the Waterloo squad.

Times have changed. Success is attractive, and this year, the team’s call for recruits brought in 100 résumés to fill 23 spaces on the 40-member squad. The returning team members are eager to deliver Waterloo’s best performance yet because the 2014 competition celebrates the 10th anniversary of iGEM with a worldwide conference in Boston, rather than a series of regional competitions leading to the final.

Waterloo will compete against more than 200 teams from Europe, Asia, the Middle East and Latin America this fall.

“After experiencing the competition, I saw so much growth in myself and realized the value I had gained by working as a team member,” said Peter Hong, the team director who is finishing his last term in chemical engineering. “I was interacting with all kinds of people and broadening my horizons and my viewpoint.”

Building a winning team

As the new director, Suzie Alexander will oversee recruiting in 2014.

iGEM requires a commitment of at least six months, and team members spend hours working together in the lab or the conference room.
Using a training camp model, senior team members set up tutorials on mathematical modelling and lab work for the incoming group. These learning opportunities are part of the team’s appeal.

“iGEM added hugely to my skill set,” said Andre Masella, a co-founder of the Waterloo team who now works in California for Google. “The most practical lab biology I know is through iGEM.” Special teams are formed based on skills — mathematical modelling, laboratory and outreach. Each group has a role to play in ensuring that the ultimate product is a success.

The lab group is tasked with creating an organism that will carry out the planned function using BioBricks. Each addition to the BioBricks playbook helps future iGEM teams and advances what researchers can do. The mathematical modelling group determines which organism-building approaches are most likely to succeed.

“Model-based design is standard in engineering,” said team advisor Brian Ingalls, an associate professor of applied mathematics in the Faculty of Mathematics. “You build a computer simulation that will allow you to explore different behaviours and design parameters so you can eliminate the options that are not as feasible.”

Game day

In international competition of this calibre, nerves are inevitable.

In 2013, the iGEM regional competition took place at the University of Toronto. In advance of competition day, teams were required to provide industry leaders and researchers who serve as judges with a summary of their project, and the BioBricks developed during their work.

The competition consisted of a 20-minute presentation, followed by a question period. Five team members presented, while others fielded questions.

“You’re condensing a whole year’s work while trying to show off,” said Jama Hagi-Yusuf, a team veteran and an honours biology student. The effort paid off with a regional win.

The main event

After celebrating their regional success, the team had one month to take its game to the next level — the international championship in Boston. Team members revamped their poster and their presentation, juggling the demands of iGEM with mid-term exams.

Twenty of them piled into a few vehicles for the 12-hour drive to Massachusetts, taking nerves and excitement along for the ride.

“We travelled together, hung out together, ate together and practised together,” said Alexander. “It was a big bonding opportunity.”

“It’s the thing that brings the year all together.”

In Boston, there was still work to be done. The team went over the presentation again and again. On presentation day, the Waterloo students put on their team T-shirts and stepped up to the microphone.

“We were extremely nervous presenting at MIT,” said Hagi-Yusuf. “The best of the best were there and it was nerve-wracking.”

The team didn’t win, but took home some highly prized experience.

“We came back with a fresh vision of what our research will do,” Alexander said. “This gives us confidence as we go forward and face the challenges of the new competition year.”

Hong, the outgoing iGEM team director, best summarized the iGEM adventure.

“It epitomizes the spirit of Waterloo, its innovation, entrepreneurship and ‘Why not?’ attitude,” he said. “We go out and look for our own money. We stay in the lab working until 5 a.m., and we go out to schools and explain our work.

“It makes sense, because that [spirit of independence] is how this school runs.”

WEB see Waterloo Teams at uwaterloo.ca/alumni/links
Alumni Achievement Award

Congratulations to our 2013 alumni influencers for making significant contributions to their professions and communities. The Alumni Awards recognize these individuals and their efforts to build a better world.

Read more about Alumni influencers who have UNLOCKED THE SECRET to success at uwaterloo.ca/alumni/2013-alumni-awards.
Alumni Influencers

Congratulations to our 2013 alumni influencers for making significant contributions to their professions and communities. The Alumni Awards recognize these individuals and their efforts to build a better world.

**Patrick Harrison** (BSc '82)
Faculty of Applied Health Sciences
Alumni Achievement Award

**Jenna van Draanen** (BSc '09)
Faculty of Applied Health Sciences
Young Alumni Award

**Kastan De Riggs** (BES '08)
Faculty of Environment
Young Alumni Award

**Sarah Brown** (BES '08)
Faculty of Environment
Young Alumni Award

**Ebele Mogo** (BSc '09)
Faculty of Science
Young Alumni Award

**Ernie R. Regehr** (BA '68)
Faculty of Arts
Alumni Achievement Award

**Ian MacNutt** (BA '68) (MA '71)
Faculty of Environment
Alumni Achievement Award

**Sandy Eix** (BSc '91)
Faculty of Science
Distinguished Alumni Award

**Deirdre Laframboise** (BES '84)
Faculty of Environment
Alumni Achievement Award

**Muneeba Adil Omar** (BA '05)
Faculty of Arts
Young Alumni Award

**Tracy Elop** (MAcc '89)
School of Accounting and Finance
Alumni Achievement Award

**Jessica Chiu** (MAcc '04)
School of Accounting and Finance
Young Alumni Achievement Award

**Lynette D. Madsen** (BASc '86) (BA '04)
Faculty of Engineering
Alumni Achievement Medal, Professional Achievement

**Andrew J. Clinton** (BASc '05)
Faculty of Engineering
Young Alumni Achievement Medal

**Steven D. Brenneman** (BASc '98), **Anton Jedlovsky** (BASc '98), and **Brian M. Orr** (BASc '98), Faculty of Engineering
Team Alumni Achievement Medal

**Hamoon Ekhtiari** (BMath '09)
Faculty of Mathematics
Young Alumni Achievement Medal

**Jane E. Kinney** (BMath '92)
Faculty of Mathematics
Alumni Achievement Medal

**Jennifer Chu-Carroll** (MMath '91)
Faculty of Mathematics
Alumni Achievement Medal

**Jay Steele** (BMath '96)
Faculty of Mathematics
J.W. Graham Medal in Computing & Innovation

**Andrew Reesor-McDowell** (BA '76)
Conrad Grebel University College
Distinguished Alumni Service Award

**Patrick J. Flynn** (BA '68)
St. Jerome's University
Fr. Norm Choate, C.R., Distinguished Graduate Award

**Charmaine Hammond** (BA '95)
Renison University College
Outstanding Alumna Award
Glaucoma can lead to tunnel vision or even blindness, and its damage can’t be reversed. More than half of glaucoma patients forget to take their eye drops regularly, putting their vision at risk. SHENGYAN LIU (Chemical Engineering) is developing a nanoparticle drug delivery system that can reduce dosage to just one drop a week.

Alzheimer’s disease is responsible for 50 to 80 per cent of dementia cases — but it can only be diagnosed with certainty post mortem. The protein that forms plaques on the brains of Alzheimer’s patients also appears on their retinas. MELANIE CAMPBELL (Physics and Astronomy, Optometry and Vision Science) is developing an instrument that can detect that protein through the eye, offering hope for an earlier diagnostic tool.

More than 200,000 Canadians have a pacemaker, a number that will likely grow as our population ages. Pacemaker batteries have an average lifespan of five to eight years — and changing them requires surgery. Using smart materials that transform vibrations into energy, ARMAGHAN SALEHIAN (Engineering) is aiming to make those batteries last longer and reduce the number of surgeries patients need.

There are an estimated nine million new cases of tuberculosis every year, but three million of them are never diagnosed. KARIM KARIM (Electrical and Computer Engineering) has developed a portable X-ray system that makes diagnosis more accessible in low-income countries.

Demand for medical laboratory tests rose 180 per cent between 1996 and 2011. A palm-sized piece of plastic may someday provide your medical test results. CAROLYN REN (Mechanical and Mechatronics Engineering) is developing a “lab-on-a-chip” that can process multiple laboratory tests at once, faster than traditional labs.

It’s estimated that about 50,000 Canadians will suffer a stroke each year — that’s one every ten minutes. With just Google Earth, Street View and an exercise bike, BILL MCILOV (Kinesiology) works stroke patients’ bodies and brains by taking them on virtual tours.

It’s estimated that one in seven men will be diagnosed with prostate cancer in their lifetime. ALEX WONG (Engineering) has developed a form of MRI that can detect previously undetectable prostate tumours.

Half of the seniors who break a hip will never regain full function — one in five will die within the year. ANDREW LAING (Kinesiology) is running clinical trials on a new kind of flooring that flexes to absorb the impact of falls — ideal for long-term care facilities.
The world’s largest functioning brain model, Spaun (Semantic Pointer Architecture Unified Network), offers exciting possibilities for biomedical testing. The creation of Chris EliaSmith (Philosophy, Systems Design Engineering), it’s the first model to perform an IQ test.

One in every 2,500 infants has craniosynostosis, the premature fusion of skull bones, which can lead to brain development problems and facial deformities. Bringing math and medicine together, André Linhares (Math) runs algorithms that help surgeons determine the best way to repair facial deformities in children with craniosynostosis.

Current medical databases rely on text descriptions to generate search results — not ideal for image retrieval. Using a new kind of search technique not driven by keywords or metadata, Hamid Tizhoosh (Systems Design Engineering) is developing image retrieval technologies that can rapidly yield search results from a vast field of visual information.

Over a lifetime, voice disorders affect around 30 per cent of the population and up to 60 per cent of teachers. Sean D. Peterson (Mechanical and Mechatronics Engineering) is creating mechanical models of vocal-fold motions that may someday help surgeons personalize treatment plans using a replica of each patient’s own vocal cords.

Radiation therapy kills cancer cells, but it damages healthy cells as well. Cancer patients who receive radiation therapy risk developing second cancers. Siv Sivaloganathan (Applied Mathematics) is developing a tool that can assess the risk of recurrence for each individual patient, so doctors can personalize their treatment plans.

A new method of delivering anti-cancer drugs directly to tumours using nanomaterials, under development in Juwen Liu’s lab (Chemistry), may help reduce damage to healthy cells in the first place.

In Ontario alone, there were more than 18,000 hip replacements and almost 25,000 knee replacements in 2012-2013. Should you need a knee or hip replacement a few years from now, you may find you can grow your own. Ehsan ToysenKani (Mechanical and Mechatronics Engineering) is 3D-printing a scaffolding that will dissolve after implantation as the patient’s bone cells grow around and inside it.

It can take up to a year of physiotherapy to recover from a hip or knee replacement — and as our population grows older, therapists will be in high demand. Dana Kulic (Electrical and Computer Engineering) is designing rehabilitation systems that will allow therapists to treat more patients more quickly and accurately.

The leading cause of job-related disability in the U.S. is lower back pain. Whether you sit or stand at work, a study being run by Clark Dickerson (Kinesiology) and Jack Callaghan (Kinesiology) will have something to tell you about your posture’s effects on your back, shoulders, and knees.

Read more about the remarkable medical research taking place at the University of Waterloo: see Health Warriors at uwaterloo.ca/alumni/links
WATERLOO ALUMNI » stay connected!

SEPTEMBER 28, 2013

STOJANA STANIVUK (BSc '12), SIM RAMAN (BSc '11), ANA STANIVUK (Candidate for BA), VLADO JOKIC (BCS '10)

FEDERATION ORIENTATION COMMITTEE REUNION (2011 FOC) — Front row: EVELYIN SUMAN (BSc '12), MICHAEL CHUNG (BES '12), LESLIE PUCAN (BA '12), KYLA BAS (BSc '14), HEATHER ISENEGGER (BMath '13), MUJEEB DURANAI (BSc '13). Back row: GERALD GAYOWSKY (BMath '13), TAYLOR KERSTENS (BA '12), ANDREW FISHER (BASc '13), JESSE MCGINNIS (Candidate for BCS)

CAMPUS RESPONSE TEAM 15TH ANNIVERSARY REUNION

JANE VAN TOEN (BSc '78), POUNCE DE LION, CHANTAL LOCATELLI (MA '80)

UPDATE your email address to receive an invitation when Waterloo connects in your city uwaterloo.ca/alumni/update
FANTASTIC ALUMNI DAY — DOUG HOLMES (BMath '95), JULIE BUNDSCHO (BA '04), LAURA MAMMOLITI (PhD '01)

ANDREW HANKE (BASc '11), KRISTINE MUSSELL, RACHEL THOMAS, JONATHAN THOMAS (BASc '11)

CHAPTER LAUNCH — JASON COOLMAN (AVP Alumni Relations), FERIDUN HAMDULLAHPUR (President), TAEHO KANG (BMath '05), YOUNGJOON WON (BMath '03), GOYOUNG MOON (PhD '01), JAEBOONG CHOI (MSc '93, PhD '97), JAMES WON-KI HONG (PhD '91), KEN McGILLIVRAY (VP Advancement), EVA CAIRNS (Hong Kong Office Director)

KARINA GRAF (BA '08, MA '10), KRISHNA MISTRY (BA '08), CLAIRE VAN NIEROP (BA '08)

RON YU (Candidate for BASc), DEREK LEUNG (Candidate for BA), EVELYN TCHAO (Candidate for BASc), HEATHER GRANT (High Commissioner of Canada to Singapore), VIBHA MURTHY (Candidate for BSc)
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WHAT ARE YOU UP TO LATELY?
Let your classmates know what you’re up to by sending a brief update to uwmagazine@uwaterloo.ca. Or visit our alumni e-community to update your profile at uwaterloo.ca/alumni/e-community.

CLASS NOTES

1967
Norm Woods (BPE ’67, Physical Education) will be honoured posthumously for his contributions to the game of golf as a co-recipient of Golf Canada’s Distinguished Service Award.

1968
Zonta Club of Kitchener-Waterloo’s annual Women of Achievement Awards recipients this year included Pat Aplevich (BA ’68, French; MA ’70, French).

1974
Mike Wilson (BASc ’74, Chemical Engineering) has been appointed to Suncor Energy’s Board of Directors.

1975
CEO Grant Roberts (BMath ’75, Pure Mathematics; MMath ’77, Computer Science) celebrates the 25th anniversary of Campana Systems Inc.

J. Bryon Wiebe (BASc ’75, Civil Engineering; MASc ’77, Civil Engineering) joins Delcan as Water Division Manager.

1977
Rick MacFarlane (BA ’77), BEd, MEd, MSW, recently retired as a principal with the Lambton Kent District School Board.

OPTOMETRY GRAD FOCUSES ON HEALTHY EYESIGHT IN GHANA

Heinz Otchere (MSc ’13, Vision Science) earned his undergraduate education in Optometry from the University of Cape Coast in Ghana, West Africa.

During his studies, Otchere worked as an intern for six years. After graduation, he spent a year as a full-time optometrist under the mentorship of Dr. Kofi Ghartey, chief executive officer of the Sight for Africa eye clinic (NGO) in Ghana.

Sight for Africa, which partners with Medical Ministry International Canada (MMI Canada), provides accessible health care, vision care and specialized contact lens services to combat complicated eye problems in Ghana.

Otchere visited Ghanaian villages where people could not afford proper vision care. He encountered cases that were destroying people’s lives.

“We had one man who could barely see anything at all,” Otchere says. “It was clear how miserable his loss of vision made him. He had been diagnosed with keratoconus, and came to see Dr. Kofi and I.”

“We fixed him within three hours with specialized contact lenses. He told us it was the first time he saw his own face looking through the mirror, and that made me realize I had to learn more about contact lenses for complicated cases.”

Otchere says poor vision causes some Ghanaian children to drop out of school. But they can be helped with proper lenses.

“These children cannot read or see anything, so they just stop attending school,” he says. “They feel so worthless from their lack of proper vision that they just give up.”

When Otchere heard that Dr. Kofi would retire after more than 35 years of service, he decided to attend the University of Waterloo to further his education and enhance his clinical skills in order to take over the contact lens service in the clinic.

Dr. Desmond Fonn at Waterloo’s School of Optometry and Vision Science helped Otchere transition into the graduate program in vision sciences as an international student.

“Coming here has made me so happy and Dr. Desmond Fonn has been an inspiration to me,” Otchere says. “The Contact Lens Clinic headed by Prof. Luigina Sorbara has patients with many different conditions. I am able to see and learn so much, and then take this knowledge back with me.”

In spring 2013, Otchere received one of two inaugural Desmond Fonn Contact Lens Research Awards for outstanding research and academic achievement.

“It was so great to be nominated by the Centre for Contact Lens Research for this award,” Otchere says. “I could have never dreamed about an honour like this.”

For more information about MMI Canada or Sight for Africa, make a financial contribution, or learn about volunteering on a two-week vision project in Ghana, please contact mmican@mmicanada.ca.

WEB Heinz Otchere at uwaterloo.ca/alumni/links | TEXT: DANA CIAK
1978
William Moss (BA '78, Anthropology), Chief Archaeologist of the City of Quebec, was awarded an honorary PhD by Laval University.

1979
Hilary Foulkes (BSc '79, Earth Sciences) has joined the Board of Directors of Enerplus.

AlphaCipher Acquisition Corporation (d/b/a Vadium) announced the appointment of Kim Holmes (BASc '79, Systems Design Engineering) to the company’s senior executive team as senior vice president — product development.

1981
Michael McQuade (BMath '81, Mathematics, 3 Year; BMath '82, Mathematics/Mgt Acc Option), advances to the role of president and general manager of U.S. Steel Canada.

1982
Robert Cross (BASc '82, Systems Design Engineering/Management Sciences) has been appointed to Graphite One Resources Inc.’s advisory board.

The Phoenix Companies, Inc. announced that Mark Griffin (BMath '82, Actuarial Science/Computer Science) has joined the company as executive vice president and chief risk officer.

1985
Sandra Hanington (BASc '85, Systems Design Engineering/Management Sciences) has been appointed to the Canada Mortgage and Housing Corporation (CMHC) Board for a term of four years.

**HENKAA’S FASHION STRATEGY A CUT ABOVE THE REST**

Joanna Duong (BMath ’04) took her passion for doing more with less and created the highly successful fashion company Henkaa, which produces convertible apparel and accessories for women.

Henkaa, which means “change” in Japanese, represents a woman’s ever-evolving life, and the ability of the company’s timeless pieces to be styled in limitless ways.

After graduating from the University of Waterloo in 2004, Duong went into the real estate business. She was recognized for excellence, receiving the Coldwell Banker Sterling Award in 2006, 2009, 2010, and 2011.

“The real estate business has slow times in the winter. After reading *The 4-Hour Work Week*, which is about starting your own company in your free time, I decided to try it out,” Duong says.

Not a fashion designer by trade, Duong says she “literally engineered the first convertible dress by merging different design elements and materials from pieces in my closet.”

“I called it the Frankenstein dress.”

Duong debuted her convertible dress at a wedding, where she received a great deal of interest — especially after women saw her dress change in style twice in one night.

Based on that positive reception and feedback from friends, Duong took her design to tradeshows, where her dress generated even more buzz. So many orders poured in that she left real estate to launch Henkaa in 2010.

Henkaa has garnered much recognition and success, hitting 15th spot on *PROFIT* magazine’s 2013 HOT 50 ranking, which tracks Canada’s top young high-growth companies. Duong was recently ranked 82 in the *PROFIT* and *Chatelaine* magazine list of Canada’s Top Female Entrepreneurs.

Duong has embedded her love of frugality and her passion for technology into Henkaa’s vision and mission. She produces fashion pieces that do more with less. She helps women shift away from disposable goods, and provides best-in-class online tools to educate customers on the product.

“I love it when I see customers come up with new and creative ways of wearing our pieces,” says Duong. “It is inspiring and humbling to me because Henkaa started from such a little idea.”

WEB Joanna Duong at uwaterloo.ca/alumni/links | TEKT: DANA CIAK
Ray Cao (BASc ’09) has given beauty-product junkies across the nation a new way to indulge their addictions.

For a nominal subscription fee Cao’s company, Luxe Box, provides customers with a deluxe collection of high-end sample beauty products delivered to their doors every three months. This allows shoppers to avoid the awkwardness of asking for product samples at beauty counters.

During his second year in Waterloo’s Systems Design Engineering program, Cao joined Impact, the largest Canadian entrepreneurship group aimed at helping youth pursue their passion for building companies. He decided he would one day be the founder of a company.

“During my last few years at Impact, and before graduation, I knew I wasn’t going to be accepting job offers,” Cao says. “I had the entrepreneurial bug. I felt that I had to build something of my own and always knew I wanted it to be in the e-commerce space.

“I didn’t know anything about the beauty industry but I just asked the women I knew about purchasing beauty products and learned that sampling was a huge part of it.”

Luxe Box’s mission is “to help consumers better discover, try and purchase quality beauty and lifestyle products through a unique experience,” and has a dedicated clientele of industry leading brand partners, including L’Oréal, Kiehl’s, and Clinique.

After customers test the products at home, they can enter product reviews on the Luxe Box website.

“Ninety-nine per cent of women take beauty samples they get in stores and use them at home, so we wanted to make it easier for them and deliver the samples they choose — or ones we recommend for them — right to their door,” Cao says.

With Luxe Box continuing to grow as the leader in beauty membership services across the country, Cao and his team decided to expand and launch Exact Media.

Exact Media uses online shopping distribution channels, such as Amazon, to get samples to customers based on their orders.

“We are providing customers with what we call complimentary sampling, to get samples to customers based on their orders,” Cao says. “During my last few years at Impact, and before graduation, I knew I wasn’t going to be accepting job offers,” Cao says. “I had the entrepreneurial bug. I felt that I had to build something of my own and always knew I wanted it to be in the e-commerce space.

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Andrea Kuciak (BASc ‘00) has a different idea of what a hobby looks like.

A mechanical engineer, Kuciak is humble about her passion for gliders and powered aircraft, and about being one of the few women pilots in the Canadian Harvard Aircraft Association (CHAA) in Tillsonburg, Ontario.

“I have always been involved in male-dominated activities by coincidence, from engineering to flying aerobatics,” Kuciak says. “I decide I want to try something, and then I make it happen.

“I didn’t have a lot growing up, and my parents sacrificed a lot for my brother, sister and I. They taught us that if there was something we wanted to do, if we worked hard enough for it, anything was within reach.”

Kuciak began flying at age 18 when she visited a gliding club with her brother. After watching and speaking with pilots, she was hooked.

She signed up at the Southern Ontario Soaring Association (SOSA). At SOSA, Kuciak earned her glider licence, glider instructor rating, and glider aerobatic instructor rating.

“Gilding is about being in the moment — nothing else matters,” Kuciak says. “It is just you and the plane. You can see for miles, fly with the birds, and feel the thermals. It is a free feeling and a great way for young people to start in flying.”

Kuciak met her husband Scott McMaster, a glider instructor and tow pilot, at SOSA. McMaster introduced her to aerobatic flying, and she went on to obtain her glider aerobatic instructor rating in her fourth year at SOSA.

Kuciak now helps run the Glider Aerobatic Program at SOSA, which attracts pilots from across Canada and around the world. While people might regard aerobatic flight as dangerous and risky, Kuciak says the craft is very controlled.

“People think it’s crazy, but it is very much about precision and learning the aircraft’s limits and staying within those limits,” she says.

Kuciak has advice for people who manage busy careers but want to take up a highly technical hobby: “Just decide what you want to try and do it. Don’t waste time making excuses about why you can’t do something.”

WEB Andrea Kuciak at uwaterloo.ca/alumni/links | TEXT: DANA CIAK

**2009**

Open Source Health Inc. announced the appointment of Mike Dai (BMath ’09, Math/CA — Finance Option; M Acc ’09, Accounting, Professional) as chief financial officer.

**2010**

Amanda Carruthers (BA ’10, Recreation and Business; MA ’13, Recreation & Leisure Studies) is the recreation director for the town of Biggar, Saskatchewan.

**2013**

Dr. Laura Kennedy (OD ’13, Optometry) is the newest addition to Dr. Barton Anderson’s Optometry practice in Pincher Creek, Alta.
It’s time to get the band back together

Mark your calendar and dust off your banjo!
Come back to campus to meet up with friends and relive your fondest memories. Watch for updates about what’s happening and be sure to register early at uwaterloo.ca/alumni/reunion.
It’s time to get the band back together. Please come back to campus to meet up with friends and relive your wonderful university days. Mark your calendar and dust off your banjo! Register and find out more at uwag.uwaterloo.ca. For more information, please contact Dheana Ramsay at events/class-74-planning-reunion@uwaterloo.ca or dramsay@uwaterloo.ca.

**MAY**

**MAY 24**
**Niagara Grebel Alumni Event**
The Good Earth Food and Wine Co., Beamsville. 4:00 p.m. Cost is $10 per person. Register and find out more at uwag.uwaterloo.ca/grebel/events/niagara-alumni-event

**JUNE**

**JUNE 2**
**University of Waterloo President’s Golf Tournament**
Westmount Golf Club, Kitchener. Registration/Lunch: 11:00 a.m., Shotgun Start: 12:15 p.m., Dinner: 6:00 p.m. Involvement Range is $2,500-$7,500. Contact Jim Hagen at 519-888-4567, ext. 35433

**JUNE 2-7**
**This Could be the Place**
East Campus Hall 1239, University of Waterloo Art Gallery. 5:00-8:00 p.m. One-day on-campus symposium featuring presentations and artists’ panel addressing performativity, immaterial labour, the politics of public space and interdisciplinary practices beyond the walls of the gallery. Contact Ivan Jurakic at 519-888-4567, ext. 36741. Find out more at uwag.uwaterloo.ca

**JUNE 5-9**
**Sound in the Land 2014 Festival/Conference**
Conrad Grebel University College. Register and find out more at uwag.uwaterloo.ca/grebel/soundland-2014

**JUNE 6 & 7, 2014**
**’74 Planning Reunion**
Meet at the University Club at 7:00 p.m. on Friday, June 6th. Customized campus tours start at 2:00 p.m. on Saturday, June 7. For more details, please visit uwag.uwaterloo.ca/environment/events/class-74-planning-reunion or contact Dheana Ramsay at 519-888-4567, ext. 32492, dramsay@uwaterloo.ca

**JUNE 20**
**Alumni and Friends Reception at the Ontario Pharmacists Conference**
Scotiabank Convention Centre, Niagara Falls. 5:00-7:00 p.m. Contact Mary Stanley at mstanley@uwaterloo.ca. Find out more at uwag.uwaterloo.ca/pharmacy/events

**JUNE 22**
**Grand Opening of New Music Facilities**
Conrad Grebel University College. 3:00 p.m. Free Admission. Milton Good Library, Mennonite Archives of Ontario, and MSCU Centre for Peace Advancement

**JUNE 26**
**Ralph and Eileen Lebold Endowment for Leadership Training Banquet**
Conrad Grebel University College. 6:30 p.m. Cost is $50 per person. Register and find out more at grebel.ca/lebold

**JULY**

**JULY 19**
**Annual Alumni Family Extravaganza**
Ontario Science Centre. Bring the family to experience the Science of Rock ‘N Roll. Find out more at uwag.uwaterloo.ca/alumni/events

**JULY 24**
**Velocity Fund Finals**
Student Life Centre, 11:00 a.m. Free Admission. Register at s14velocityfundfinals.eventbrite.ca. Find out more at velocity.uwaterloo.ca

**AUGUST**

**DATE TO BE CONFIRMED**
**MDEI Showcase**
125 St. Patrick St., Stratford. 7-9 p.m. Contact Brandi Gillett bgillett@uwaterloo.ca 519-888-4567, ext. 23006. Find out more at uwag.uwaterloo.ca/stratford-campus/events

**SEPTEMBER**

**SEPTEMBER 8**
**Waterloo Pharmacy Golf Invitational**
Grey Silo Golf Club. Connect with students, faculty, and former classmate and support the School of Pharmacy. Contact Mary Stanley at mstanley@uwaterloo.ca. Register and find out more at uwag.uwaterloo.ca/pharmacy/events

**SEPTEMBER 11-25**
**Lois Andison: Relay**
East Campus Hall 1239, University of Waterloo Art Gallery, Opening Reception: September 11, 5:00-8:00 p.m. Part of three concurrent solo exhibitions featuring recent video, mixed media and kinetic installations by Fine Arts faculty Lois Andison. Presented in collaboration with the University of Toronto Scarborough and Brock University. Contact Ivan Jurakic at 519-888-4567, ext. 36741, jurakic@uwaterloo.ca. Find out more at uwag.uwaterloo.ca

**SEPTEMBER 24**
**Career Fair**
RIM Park, Waterloo. 10:00 a.m.-3:30 p.m. Admission restricted to students and alumni from Conestoga College, University of Guelph, University of Waterloo and Wilfrid Laurier University. Student/alumni ID required for admission. Network with potential employers. Contact Dana Evans Lalty at 519-888-4567, ext. 31944, dana.evansalty@uwaterloo.ca. Find out more at partners4employment.ca/home.htm

**SEPTEMBER 25**
**Celebrating International Day of Peace**
Great Hall, Conrad Grebel University College. Free Admission. Open to Public. Peace and Conflict Studies lecture featuring distinguished alumnus Lisa Schirch. Contact 519-885-0220, ext. 24216, pacs@uwaterloo.ca

**SEPTEMBER 27**
**Revisit, Reunite, Relay**
Revisit campus, reunite with classmates and friends, and relive your fondest Waterloo memories. Watch for updates and register early at uwag.uwaterloo.ca/alumni/reunion

**SEPTEMBER 29**
**29th Annual AHS Fun Run**
Celebrate active living by running or walking 2.5km or 5km around Waterloo’s Ring Road. Bib tag timing available for 5km. BMH & Ring Road, University of Waterloo, 9 a.m. to noon. Contact Mari-Beth Davis at mbdavis@uwaterloo.ca, 519-888-4567, ext. 32610. waterloo.ca/applied-health-sciences/alumni/events/ahs-annual-reunion-banquet

**WEEKEND EVENT**

**SEPTEMBER 27**
**Revisit, Reunite, Relay**
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**SEPTMBER 27**
**Reunion Football Game**
Support the Waterloo football team taking on the Western Mustangs on Warrior Field at 1 p.m. Register for the Alumni VIP tent. Register and find out more at gowarriorsgo.ca/reunion2014

**SEPTEMBER 28**
**East Asian Festival — Celebrating 20 years**
Great Hall, Renison University College, 11:00 a.m. – 2:00 p.m. Free Admission. Open to Public. Entertainment, food, exhibits, face painting and more. Find out more at uwag.uwaterloo.ca/reunions or e-mail tantonio@uwaterloo.ca

**SEPTEMBER 29**
**Appled Health Sciences Class Reunion Banquet**
The 20th, 25th, 30th, 35th & 40th Anniversaries of Health Studies, Kinesiology, and Recreation & Leisure Studies Alumni at the Waterloo Inn, 5:30-11:30 p.m. Dinner & music, ticket price TBA. Contact Mari-Beth Davis at mbdavis@uwaterloo.ca, 519-888-4567, ext. 32610, waterloo.ca/applied-health-sciences/alumni/events/ahs-alumni-reunion-banquet

**SEPTEMBER 30**
**Waterloo Engineering 25-year Reunion**
Class of 1989. Celebrate this amazing milestone in your engineering career with your classmates while renewing your engineering obligation. Contact us at 519-888-4567, ext. 37827 or engineering.alumni@uwaterloo.ca. Find out more at uwag.uwaterloo.ca/engineering/alumni/reunions.

**SEPTEMBER 30**
**Waterloo Engineering 50-year Reunion**
Class of 1964. Celebrate this amazing milestone in your engineering career with your classmates while receiving a special 50th anniversary Iron Ring during the obligation renewal. Contact us at 519-888-4567, ext. 37827 or engineering.alumni@uwaterloo.ca. Find out more at uwag.uwaterloo.ca/engineering/alumni/reunions.

**SEPTEMBER 30**
**Sixties Era Grebel Alumni Reunion**
More details at uwag.uwaterloo.ca/grebel/upcoming-reunions
The absurdity of inequity

Someone recently asked me the following question: “Ten to 20 years from now, what would you consider absurd?” Examples included smoking on planes, not recycling, and women not being able to vote. My response was immediate, “Inequity.” It instinctually rolled off my tongue, perhaps because addressing its public health manifestations in the developing world has become my life’s work. Over six million children under the age of five will die this year. The majority of these deaths are due to conditions that could be prevented or treated with access to simple, affordable, existing solutions. Childhood trips to India, where I witnessed the impacts of poverty on children my own age, had a profound effect on the way I saw and thought about the world. As a Canadian (and a human being more generally), it instilled a sense of responsibility in me. It wasn’t until years later that I was introduced to the practice and profession of public health at the University of Waterloo. After entering the health studies program, I quickly became enthralled with social and behavioral sciences, epidemiology, and nutrition. I hate to admit it, but I even found biostatistics interesting.

The idea of being able to improve the health of thousands or millions of people at a time excited me — particularly when it came to issues of equity and human justice. I was exposed to a holistic way of thinking about the human experience, and encouraged to apply this “systems-thinking” to real world problems. I had found my calling.

As a practitioner of global health, I have had the opportunity to work in developing countries around the world. While I’ve witnessed tremendous progress in the health and development sector, the rate of improvement leaves much to be celebrated. The 4th Millennium Development Goal (MDG 4) aims to reduce the 1990 mortality rate among children under five by two thirds. If current trends were to continue, the world would not meet the MDG 4 target until 2028. An additional 35 million children would die.

While progress and advances in other areas of science and technology are developing at a rate the world has never seen before, the rate of progress in evolving people’s health, and improving basic quality of life, simply has not kept pace. Clearly, the status quo isn’t cutting it. There is a clear need for new and innovative approaches involving transdisciplinary and cross-sector partnerships.

I am dumbfounded, for example, by the fact that we can put robots on Mars, yet we can’t get simple medicines to the people that need them the most. ORS and Zinc are two examples of cheap, effective medicines that could have saved the lives of the nearly 600,000 children that died from diarrhea related causes in 2012 (making it the second leading cause of childhood mortality). Yet access to this globally recommended medicine to the people that need it the most. ORS and Zinc are two examples of cheap, effective medicines that could have saved the lives of the nearly 600,000 children that died from diarrhea related causes in 2012 (making it the second leading cause of childhood mortality). Yet access to this globally recommended medicine to the people that need it the most. ORS and Zinc are two examples of cheap, effective medicines that could have saved the lives of the nearly 600,000 children that died from diarrhea related causes in 2012 (making it the second leading cause of childhood mortality). Yet access to this globally recommended medicine to the people that need it the most. ORS and Zinc are two examples of cheap, effective medicines that could have saved the lives of the nearly 600,000 children that died from diarrhea related causes in 2012 (making it the second leading cause of childhood mortality). Yet access to this globally recommended medicine to the people that need it the most. ORS and Zinc are two examples of cheap, effective medicines that could have saved the lives of the nearly 600,000 children that died from diarrhea related causes in 2012 (making it the second leading cause of childhood mortality). Yet access to this globally recommended medicine to the people that need it the most. ORS and Zinc are two examples of cheap, effective medicines that could have saved the lives of the nearly 600,000 children that died from diarrhea related causes in 2012 (making it the second leading cause of childhood mortality). Yet access to this globally recommended medicine to the people that need it the most. ORS and Zinc are two examples of cheap, effective medicines that could have saved the lives of the nearly 600,000 children that died from diarrhea related causes in 2012 (making it the second leading cause of childhood mortality). Yet access to this globally recommended therapy is still very low. Global health delivery and implementation sciences are of paramount importance in advancing global health.

My work over the past few years, and the basis of my doctoral research, has focused on improving access to life-saving medicines in the farthest reaches of the developing world through the development of a public-private partnership with Coca-Cola (a product that gets everywhere) and its system partners in Zambia, and evaluating the impact of this model in getting essential medicines to the community level.

By applying the successful principles used by Coke to public health commodity and the establishment of its value-chain, ColaLife has been able to substantially improve access to ORS and Zinc in rural Zambia.

I leave you with the same question I began with: in 10 or 20 years from now, what would you consider to be absurd?

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