Fall 2010 www.engineering.ualberta.ca

U of A Engineer

Keeping in Touch with
Alumni

BRIDGING A TECHNOLOGICAL GAP

An engineering family is bringing radical change to structural engineering with an innovative new technology

A biomedical revolution

The clean team

From Panda to construction mogul

The air that you breathe

Message from the Acting Assistant Dean External Relations

It's hard to believe that summer has come and gone and fall is upon us. Like the rest of you, we spend part of the summer trying to juggle our daily responsibilities to make time for family or friends visiting from faraway places, planning our own getaways and enjoying a bit of R & R.

Throughout the summer, we're also busy assisting our alumni with preparations for Alumni Weekend. The alumni relations staff in our engineering departments work closely with our wonderful class organizers to make sure everything is in order. I want to thank our class organizers and alumni relations staff for making this year's Alumni Weekend a success. We hope that those of you who were able to come back to campus had an enjoyable time, and were able to reconnect with friends and former classmates. Please mark your calendars for Alumni Weekend 2011. The dates are September 22 to 25.

Another highlight from our summer was the opportunity to pore over more than 160 photo submissions for this year's Engineering Calendar. I'm not complaining, but that's a lot of images! More to the point, it is a lot of really good images. Printed out on 8-1/2 x 11 paper, the photos covered about eight long meeting tables. We hardly knew how to begin making selections, so we applied two rules of thumb: does the image deal with the calendar's theme, Energy? And secondly, could you look at the photo for a whole month? Once we established these criteria, we then needed to imagine the mood of the calendar, by assigning pictures to months and considering the mood each evokes for the time of year. And finally, we ensured that the calendar has a good balance of colour throughout.

Selecting the images for the calendar is a challenging task but a rewarding one. The artistic talents of the many alumni who contribute photos to this project never cease to impress me. It goes to show that our alumni share a habit of never taking anything at face value, preferring instead to examine things from many different angles, gaining a unique perspective on the world.

The calendar should be arriving in your mailboxes by mid-October, and I'm positive you'll enjoy the artistic talents of your peers throughout the coming year. I'm sure you're aware that the calendar is not only a gift to you, but also represents a way that you can support students and research in the Faculty of Engineering. Your gifts have an enduring impact on the future of the Faculty, our future engineers, and research projects and we are enormously grateful for such support.

We hope you'll enjoy this issue of U of A Engineer—and remember to check your mailbox later this fall for the 2011 calendar!

Yours truly,

Laurie Shinkaruk
Acting Assistant Dean, External Relations

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Fall 2010 Issue 29

U of A Engineer is the Faculty of Engineering alumni magazine. It is published three times a year by the Dean's Office and is distributed to Faculty of Engineering alumni, friends, students and staff.

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VISION To be one of the largest and most accomplished engineering teaching and research centres, a leader in North America.

MISSION To prepare top quality engineering professionals, to conduct world-leading research, and to celebrate the first-class reputation and outstanding accomplishments of alumni.

VALUES Dedication, integrity, professionalism, and excellence in teaching, research, and service to the global economy and community.

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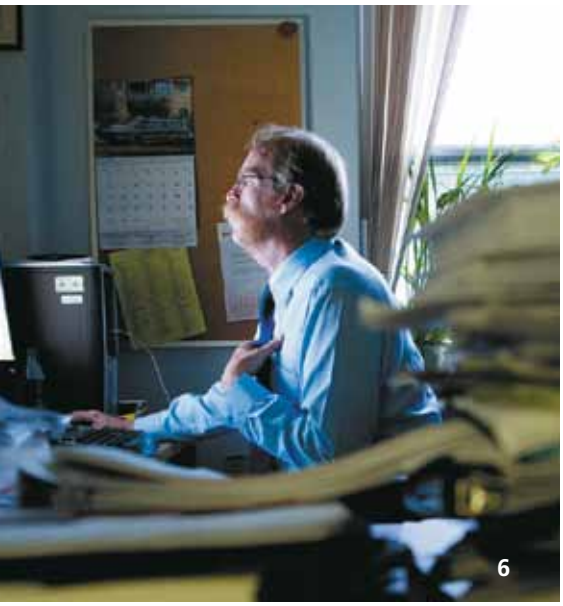

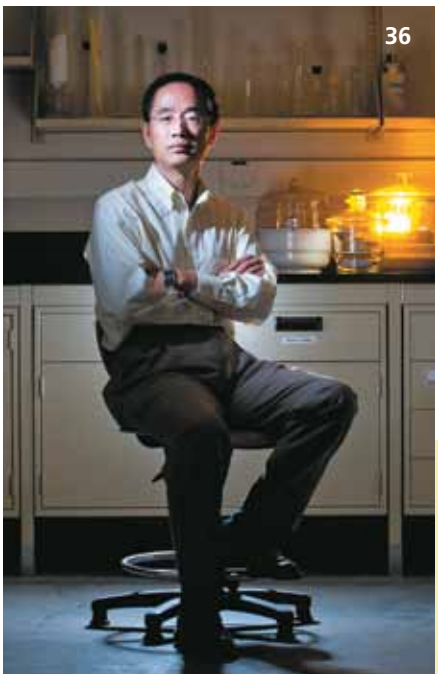

COVER STORY

DEPARTMENTS

Message from the Editor

The readers have written

It's still a little bit like reading tea leaves but the results of the readership survey questions printed in the last edition of U of A Engineer are in. You'll find an article reporting details of the survey results on page 40 of this issue. But surveys give you more than statistics, and that's where the tea leaf reading comes in.

It's a tricky thing to design a survey. You need to ask precise questions but with all of the nuances of something like a magazine, it's still difficult for readers to express themselves fully. That's why a number of our survey questions were open—that is, readers were asked to key in comments of their own.

In many respects, these kinds of questions are a dialogue between a publication and its readers. I'd like to address some of the observations and comments, and invite your ongoing participation in improving the magazine.

First, we'll get to the very basics: the tone and content of the magazine. There are conflicting feelings about the positive tone and content of the magazine. Some readers dislike the fact that the articles are positive in tone; others appreciate it. Some readers commented that we should take a harder look at issues and write about "average" engineers in the profession rather than those who have won some prestigious award.

"I'm sure that many of us are excelling in our careers in ways that won't be measured with an award or job title," one reader said. "I'd like to see more articles on what the 'average' alumnus is doing. After all, that's probably a better indicator of the quality of the program than singling out those that have done post-grad work or excelled in the corporate world."

These are important observations and, as editor, I agree with both positions—contradictory or not. The communications field is filled with ambiguity and both sides of the tone and content issue are valid.

Here is a solution: please contact me with story ideas. This is your magazine, and your contributions will only improve it.

On the matter of submitting story ideas, the survey yielded some really great results. Guest editorials from alumni who have expertise in some area, profiles on engineering alumni who are not practicing engineering, coverage of energy and the environment, the contributions of engineers in the developing world—these are all outstanding ideas that we will act on.

One reader has advised us to take a harder, more critical approach to stories. My feeling is that we can do just that when the subject matter is right. Articles on energy and the environment and the work our alumni are doing in the third world could carry that tone.

While readers are generally satisfied with the magazine's layout, design and photography, we've been taking steps in the past few issues to improve on the magazine's look—particularly with our photography. This issue in particular features a new look in terms of photography. More changes will be coming in future issues of the magazine.

While the vast majority of survey respondents said they prefer to read a print version of the magazine over an electronic version, one reader did ask where the magazine can be found online. (Our Faculty website has recently been redesigned.)

The magazine and archives can be found online at: www.engineering.ualberta.ca/Alumni/StayConnected.aspx

Finally, a note on the subject everyone (or at least one survey respondent) loves to hate: proofreading and typographical errors. We do have proofreading protocols that we follow closely but we are, alas, merely human. We ask only that you bare with us and no that we are dewing our best.

Again, please contact me at any time with story ideas, comments or questions. I can be reached at 780-492-4514 or via e-mail at: richard.cairney@ualberta.ca

Richard Cairney

Richard Cairney
Managing Editor

facebook

Staying in touch just got easier

Want to be informed about what's going on in the Faculty of Engineering? Want to hear about other alumni, students and professors?

Become a fan of the U of A's Facebook page—you'll get news, photos and videos about the Faculty, students, and alumni sent directly to your own Facebook account.

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Lynch appointed to fourth term as Dean

David Lynch has been appointed as dean of the Faculty of Engineering for another five-year term of office, effective July 1, 2010. This is his fourth term as dean of engineering.

"The Faculty of Engineering has achieved a long list of accomplishments under the leadership of Dean Lynch over the last 15 years," said Carl Amrhein, provost and vice-president (academic). "Dean Lynch's greatest strengths are in assessing the status of the Faculty, envisioning steps to advance to the next level and planning how to get there. He then continually plans, finds new pools of resources, engages others and builds."

Born and raised in Minto, New Brunswick, Lynch received his bachelor of science degree in chemical engineering from the University of New Brunswick in 1977. With a Governor General's Gold Medal in tow—awarded to the undergraduate student who had achieved the most outstanding academic record in the overall UNB graduating class—Lynch came west to take on a PhD in chemical engineering at the U of A.

Lynch made the jump into administration as the associate dean of engineering in 1992. In the midst of the budget reductions of the mid-1990s, Lynch suddenly found himself in the role of acting dean. On July 1, 1995, he was named dean.

Faced with a university-wide 21-per-cent budget reduction, Lynch says he saw those early days of his tenure as an "important transition point for the Faculty of Engineering."

In his role as dean of engineering, Lynch has been heavily involved in three main areas: the recruitment of outstanding students; the recruitment and retention of outstanding new faculty; and the obtaining of resources to provide an exceptional educational and research environment for all students and staff.

"We've managed to double the number of faculty members since I first started; we've dramatically increased our student enrolment at the undergraduate and graduate levels with increasingly higher qualified students and we have had sensational developments in energy, nanotechnology, information communications technology, and biomedical engineering, not to mention the Faculty's increasingly international scope and reputation," he says.

Lynch says he has always been most proud of seeing the exceptional educational and research environment that the Faculty of Engineering has provided for the increasing numbers of students.

"Ultimately, the university is a people place: a place for the development of the people, and the support of the people for education, research and service," he said. "That's the thing that I continue to be most excited about and most proud about seeing—how that has developed spectacularly in the Faculty of Engineering."

Being careful not to take his eye off of the faculty's long-term goals, Lynch says he plans to improve faculty-student ratios to further increase the quality of the student experience and expand funding for undergraduate and graduate students. He plans to continue the growth of the faculty, meeting student enrolment targets and increasing the faculty complement with more high-quality appointments. Lynch also wants to deal with some of the major issues concerning the renewal of the university's older engineering facilities as well as a number of major initiatives on the way including the Nano-Bio Accelerator, the Helmholtz-Alberta International research agreement (see article page 38) and several other projects that have major national and international scope.

David Lynch, seen here teaching a fourth-year engineering class—has been appointed to a fourth term as Dean of the Faculty of Engineering.

Now, as he enters his fourth term as dean, Lynch is again faced with navigating difficult financial times. During the review process for his re-appointment, Lynch was asked what his five-year vision for the Faculty of Engineering was. He replied that a five-year vision is too short of a time frame, and addressed the next quarter century, instead. Having a solid long-term plan and following it is more effective than continually reacting to short-term challenges.

"What nobody knows today is what new opportunities will be available to us over the next five years," says Lynch. "What the previous 15 years as dean have demonstrated to me is that, from the start of a term as dean, the circumstances can change rapidly, both positively and negatively.

"The next five years will be marked by having a good long-term plan and the ability to develop and seize those opportunities as they come available, in the context of knowing where it is we want to go."

Engineering is making important advances in medicine

by Richard Cairney

STARTING A REVOLUTION

Jimmy Jeong

Robert Burrell was touring burn units at Australian hospitals in October 2002 when victims of the Bali terrorist bombings began to arrive in emergency rooms. Harried medical personnel invited Burrell into operating theatres at the Royal Brisbane Hospital to provide technical advice on the use of Acticoat, a silver-based wound dressing he invented. Used in burn units and in neonatal care centres around the world, Acticoat has antimicrobial properties and speeds healing. The revolutionary dressing is considered one of the most radical advances in wound-care history.

"It was almost overwhelming to see the dressing being used under such tragic conditions, but there was a tremendous satisfaction in seeing the results of its use," says Burrell. "Many people can alter the bottom line for a company, but very few people can alter the outcomes of people's lives. I am lucky to be one of the few."

A chemical and materials engineering professor, Canada Research Chair in Nanostructured Biomaterials, and chair of the Department of Biomedical Engineering at the University of Alberta, Burrell invented Acticoat in 1995 while working for Westaim Corporation's Nucryst Pharmaceuticals.

His work has been recognized nationally and internationally through numerous awards including the 2009 Encana Principal Innovation Award from The Ernest C. Manning Awards Foundation for the development of Acticoat; the 2009 ASM International—ASM Engineering Materials Achievement Award for the development of technology and manufacturing methods for silver-based nano-structured antimicrobial and anti-inflammatory coatings with significant and wide ranging clinical and patient benefits; and the 2008 World Union of Wound Healing Society Lifetime Achievement Award for contributions to wound healing around the world.

Department of Biomedical Engineering Chair Rob Burrell is bridging diverse disciplines to help bring engineers and medical practitioners together.

Acticoat uses nanocrystalline silver technology to deliver unique silver moieties to wound sites—markedly speeding healing while also fighting off infections. The dressing was the first commercial therapeutic application of nanotechnology in the world. Today, Burrell is researching ways to deliver nanostructured metal therapeutics, known to reduce inflammation, without the side effects that accompany some existing treatments. And, as chair of Biomedical Engineering, he's overseeing a new wave in engineering and medicine.

Burrell describes biomedical engineering as the application of engineering principles to the development of medical solutions, ranging from assistive medical technologies through to new surgical procedures and the development of devices and drugs. It is interdisciplinary by its very nature, bringing together the complicated worlds of medicine and mechanics, microbiology and materials engineering, and leading-edge technology like MRIs. As well as administering the department—which is run jointly by the Faculty of Medicine and Dentistry and the Faculty of Engineering—Burrell also finds himself building bridges across academic disciplines and professions.

It's a daunting challenge, but one Burrell has met head on. For example, he initiated the strategy of having doctors make presentations to engineers. A doctor will describe a medical challenge to a room full of engineering professors and graduate students, and ask them to view the problem with a fresh perspective. In one such meeting, neonatologist Dr. Bernard Thebaud spoke about a problem that plagues premature babies in neonatal intensive care units: there is no way to monitor the amount of CO^2 in the blood of the tiny patients without drawing blood either through a catheter line or by puncturing the skin of a frail newborn—some of whom are up to three months premature.

Monitoring the infants' exhaled breath isn't always reliable, says Thebaud. "So we end up drawing blood anyway and it is a big issue—it means we have to open a line that takes blood away from a baby that needs it, and we may end up having to transfuse the baby and that means there are opportunities for infection."

In a presentation Burrell set up, Thebaud asked engineering professors and graduate students to come up with some way to read CO^2 blood content externally. Questions and ideas began to fly around the room and the end of the meeting seemed to come too soon—the engineering professors were beginning to run with some ideas. No solution is immediately forthcoming, but important connections were formed that day.

Burrell takes satisfaction in that.

"You can't force people to work together, so what we are doing is creating an environment that facilitates the collaboration between caregivers and engineers," says Burrell. After that, it's up to the researchers to find common ground—but that isn't always easy. Even the languages of the two fields of study are radically different.

"To engineers, plasma is a charged gas mass, and to a physician or caregiver it is something that is in your bloodstream. We use different words differently—so in biomedical engineering we also have to train people to become translators so they can bridge the language gap," says Burrell.

"Historically what academia has been good at is building silos, and they are very well built. You have your own jargon inside

BIOMEDICINE THRIVING IN FACULTY

Collaborations between the Faculty of Engineering and the world of medicine have been going on for decades. The highest-profile impact no doubt comes from the work of Ray Rajotte (PhD Electrical '75) who was the first person in U of A history to have biomedical engineering designated on a U of A degree. Now director of the Surgical Medical Research Institute, Rajotte conducted the foundational research that led to the development of the Edmonton Protocol treatment for type 1 diabetes.

Electrical engineering professor Chris Backhouse began working with oncologist Linda Pilarski more than a decade ago. Their collaboration has led to the development of lab-on-a-chip diagnostics. Using nanotechnology, these small devices put the power of a large research lab into handheld devices that could give front-line health professionals the ability to conduct rapid, affordable diagnostic testing that could lead to earlier detection of diseases.

The history of interdisciplinary and innovative work continues today. Chemical and Materials Engineering professor Janet Elliott, who holds the Canada Research Chair in Interfacial Thermodynamics, has been working with the U of A's cryopreservation team for the better part of a decade, working to overcome the challenges of freezing and thawing cells, tissues and, one day, organs.

Elliott first met biophysicist Locksley McGann, who leads the cryopreservation team, when they were seated together at a luncheon and discovered an overlap in their disciplines. Simply put, McGann's team needed a thermodynamicist's expertise to understand the basic physical processes underlying cryobiology.

Their combined efforts have shed new light on the cell-freezing process and allowed cryobiology to move forward on more solid footing.

In the Department of Mechanical Engineering, biomedical research abounds. Professor Kajsa Duke (MEng '01) conducts research into orthopaedic biomechanics. One of the projects she is working on would give orthopaedic surgeons the ability to implant bone plates that are tailor made to individual patients. She also collaborates with researchers at the Glenrose Rehabilitation Hospital and the Stollery Children's Hospital on projects related to scoliosis research. Warren Finlay has earned international recognition for developing an accurate throat geometry that has led to improvements in the delivery of aerosolized and inhaled drugs.

In the Department of Civil and Environmental Engineering, structural engineering professor Samr Adeeb is involved in research modelling the human jaw in order to understand the development of bone growth—with the ultimate goal of using ultrasound therapies to promote bone growth, studying the topography of bones in scoliosis patients, conducting analysis of shoulder repair constructs and more.

The Faculty of Engineering currently offers five biomedical degree programs

Photos show the feet of an 86-year-old female patient suffering from venous ulcers, before and after treatment with Acticoat. The left photo was taken after 10 years of treatment using a one percent Silver Sulfa Diazine cream—for the last two of those 10 years, the treatment was performed daily. The patient was then enrolled in a clinical trial of Acticoat, the wound dressing invented by Rob Burrell. Seeing remarkable improvements after 10 days of treatment on the right foot, caregivers asked permission to treat the woman's left foot as well. The photo at right shows the patient's feet after 60 days and 70 days of daily treatments with Acticoat. Burrell points out that as well as improving the patient's quality of life immeasurably, the treatment also saved the health care system hundreds of thousands of dollars being spent on the old, ineffective treatment.

the silo—the very purpose of the silo was to isolate people. So we have to stick our heads in the engineers' silo and equally engineers have to stick their heads into the medicine silo and talk to clinicians to make sense of problems."

Burrell himself is a prime example of this kind of interdisciplinary thinking. His undergraduate degree was in zoology, his master's degree dealt with microbial toxicity, and his PhD examined ecotoxicology. "My whole professional career has been spent working in engineering environments as the only life scientist working with different groups of engineers," he says.

"Rob is not an engineer," says Dr. Rick Snyder, a professor emeritus and one of the Department of Biomedical Engineering's longest-serving academics and researchers. "But he knew what engineering had to bring to his research and he has saved God knows how many lives with his dressing … and that is what matters to the people in this area: our mandate is to improve health care through engineering. Those five words say it all."

Mechanical engineering professor Warren Findlay is another example, Snyder adds. Findlay, an internationally recognized educator and researcher who specializes in the delivery of aerosolized and inhalable drugs—like those delivered by asthma inhalers—has developed a mouth-throat geometry that has been adopted worldwide by companies testing inhaler prototypes. He is also working with Richard Thompson, an MRI researcher in the Department of Biomedical Engineering, to further develop an understanding of physiology and the way different inhaled drugs are delivered.

Snyder himself is similarly inclined. He arrived at the U of A with a PhD in physics in 1968, and began working on early versions of positron imaging before later moving into magnetic resonance imaging.

A staunch proponent of interdisciplinary work, Snyder estimates there are at least 60 researchers at the U of A involved in biomedical engineering—and not all of them are housed within the Faculties of Medicine and Dentistry and Engineering. Snyder would like to see even more silos torn down, but is nonetheless impressed with recent developments, such as the merger of the Department of Biomedical Engineering with both faculties in July of 2009, and with new biomedical engineering courses.

"The important thing to remember about biomedical engineering is it has changed and evolved dramatically. At one time engineers were doing what we commonly associated with engineering work. Today, you find biological labs over in engineering buildings, and people in biomedical engineering know molecules—they know the basic biology—and all of the engineering departments have people doing biomedical engineering research and there are undergraduate programs now," he says. "It has evolved and is evolving very rapidly."

Snyder says the modern era of biomedical engineering really began to take shape when electrical engineers began working with physiologists to measure physical functions. The electrocardiogram (ECG) is one such device; another is the pulse oximeter, the tiny clamp patients wear on their fingers that uses light to measure oxygen content in the blood.

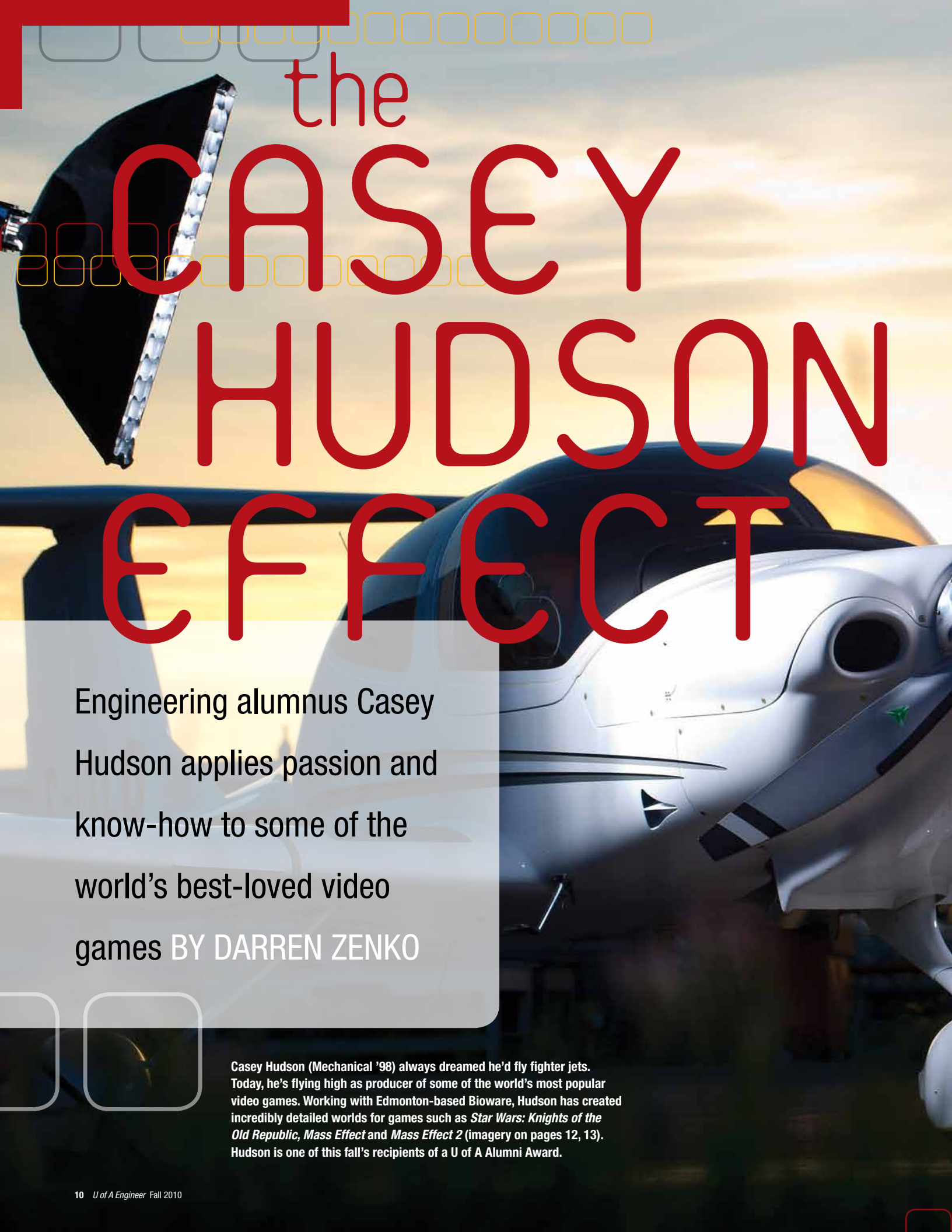
"This device was a major breakthrough. You used to have to take blood samples constantly and send them to the lab for analysis, but now we have constant monitoring of the amount of oxygen in the blood," he says.

Which brings us back to the matter of providing care for premature babies. Thebaud is hopeful that there may be an engineered solution to the problem.

"Now, they will try to use their engineering expertise to solve a medical problem," says Thebaud. "So, there is work going on now. I can't predict how long it might take but they are working on this biotechnological challenge."

the CASEY HUDSON EFFECT

Engineering alumnus Casey Hudson applies passion and know-how to some of the world's best-loved video games BY DARREN ZENKO



Casey Hudson (Mechanical '98) always dreamed he'd fly fighter jets. Today, he's flying high as producer of some of the world's most popular video games. Working with Edmonton-based Bioware, Hudson has created incredibly detailed worlds for games such as *Star Wars: Knights of the Old Republic*, *Mass Effect* and *Mass Effect 2* (imagery on pages 12, 13). Hudson is one of this fall's recipients of a U of A Alumni Award.

Jimmy Jeong

The practical, concrete aspects of mechanical engineering may seem galactic sectors removed from a career in creating star-spanning adventures. But for Casey Hudson (Mechanical '98), producer of *Star Wars: Knights of the Old Republic* and the *Mass Effect* series at Edmonton-based video game developer Bioware Corp., a background in engineering provides the critical tools that allow him to bring together his widely varied interests in the service of creating great video games.

"You get into engineering to learn how the world works, and that's so applicable to anything, especially if you're trying to build a world," says Hudson, whose most recent project, the science-fiction role-playing epic *Mass Effect 2*, sold over two million copies in its first month alone. "I can tell you that even now, in my everyday work, my background in engineering really helps.

"There's great stuff that I learned about managing a project, running an enterprise, having a business plan and an exit plan, that kind of stuff. All the project courses that you do are really great in terms of understanding how to work with other technical people and give feedback, to encourage them to do what they do best."

Hudson says that, while a student, he certainly saw his work as a part of a career path leading to traditional engineering work. But it was also something more—a solid foundation for anything else he might choose to do. One of those options was a career in the military. Mechanical engineering is one of the recommended degrees

for military pilots and Hudson, an Air Cadet with a lifelong love of aerospace and aviation, had his sights set on a future filled with high-flying hardware. Fate and his own artistic nature had other plans for Hudson.

In his last year of engineering, Hudson was still interested in joining the military. A long-standing hiring freeze for pilots in the forces had been lifted, and while most of the personnel being hired were experienced military pilots that had been retired early, Hudson stuck to his dream. But he also explored other possibilities. That's when he saw an episode of the CBC business program *Venture* that profiled an up-and-coming game-development studio in Edmonton, called Bioware.

"I had been thinking that maybe that would be something I'd like to do," says Hudson. "I'd been programming games for fun, working on graphics stuff and tools, doing 3-D modeling, so I naturally thought video games might be a career but I hadn't thought about it seriously until I realized there was a major studio in town—and when I say 'major', it was small, but at that time everything was small—so I started talking to them as well.

"Over the course of that summer, I was developing all three things, evaluating them against each other. I had an interview with an engineering company, I had my papers ready to go to join the military, and I had been talking with (Bioware founders Greg Zeschuk and Ray Muzyka) about joining Bioware. It came down to having to answer all of them in the same week; I had a really clear decision point. And I just thought, 'There's no reason why I'm going to be the best pilot ever, or why in a room with 60 engineers I'm going to be the one that advances out of that room and does something great, because it leaves so many things that I love and that I can do out of the equation.'

"And then I thought about video games and thought, 'I have a passion for it, and I also have a passion for all these other things, for music and art and programming and all the other stuff.' I felt I had so much more leverage to really carve out something. It was a big gamble, and I knew it was, but I also just felt right about it."

Hudson explains that one of the reasons he was hired as a video-game artist is because of his engineering degree. "Greg and Ray, who themselves have professional education—they're physicians—respected my degree and knew I was probably a guy who knows how to create technical solutions regardless of what they are. They didn't know what kinds of challenges they were going to come up against in developing video games, but maybe if you're an engineer, and you're an artist, you'll be able to figure out new tools or new systems."

After two years as a technical artist, Hudson got the call to move up. He had done enough of the different aspects of game development, and just through sheer passion he had been talking to all of his colleagues about what they did and how different aspects of game development worked, learning how a whole game comes together. "That put me in the position to be the guy they selected to head up *Star Wars: Knights of the Old Republic*."

Through the development of *Knights of the Old Republic, Mass Effect*, and *Mass Effect 2*, Hudson has realized great value from the experience in planning, management and team-building that his engineering studies provided him. But the intangible side of engineering, the trained ability to understand or feel a system intuitively as well as objectively, has also come into play.

"There was one time I could tell, by playing the game, that the speed of it was sensitive to the framerate (the rate at which a game's hardware and software "draw" images on the screen)," says Hudson. "A game that's coded properly should be framerate-independent: the rate might go down, but the action stays the same. I talked to the programmer, and he looks at his code and said 'Nope. Look: there's the line that says it should be framerate-independent.' I played it some more and went back and said 'You're accounting for it twice, somewhere else in the code.' He went back and did a search and there it was.

"Just being able to sense that…I think that's what engineers are good at, to be able to look at what's happening, what this black box is doing, and from that imagining what's inside the box, knowing what's inside the box without having to open it."

But if there's anything that Hudson has taken away from engineering in his work as a game artist, it's the discipline's utility as a robust, all-purpose tool for getting things done.

"I'm pretty sure I heard this several times in engineering, the idea that you can accomplish something, a huge project, however large it is, by breaking it down into smaller pieces, and breaking those pieces into smaller pieces, until this thing, which might be incredibly ambitious, might have never been done before, is now just a series of tasks and steps, little questions that need to be figured out, and all those things are totally achievable. And at that point, you know you can do it.

"The only thing that's really exciting to me," Hudson continues, "is when I know we're doing something that's never been done before, and it's going to be the biggest, and it's going to be the best. That's what makes it worthwhile. But what makes it achievable is to take this thing you don't even know can be done and say, 'First we need to answer this question, and then we need to do this work,' and then you just work through it."

For Hudson and his team working on *Mass Effect 2*, in which the focus of the game is on players' choices and how they affect the ongoing story, the challenge was to engineer the sequels so that players are having a continuous narrative experience over the entire series.

"The concept behind *Mass Effect* that's never been done before," Hudson explains, "is that you create a character in 2007 for the game, and over the course of several years of your real life and over the course of three titles in a trilogy, you're taking that same character and all your choices and decisions and repercussions cascade forward. So when you get to the second game, you pull in that character and now in 2010 you're playing the continued story of that same character in a truly interactive story. *Mass Effect 2* is the first game that does that, that as a sequel looks back to the first game and makes your story flavoured and influenced by all the decisions you've made before."

Even as Hudson credits engineering for giving him the tools he needed to pull his passions together to make his award-winning games, he hopes that message will get out to others considering engineering profession—or any profession.

"The thing that's missing from high-school career counselling is a single point: that you can do the thing you want, you can be involved in the world that excites you, from any discipline. A lot of kids will say, "I don't know what I want to do. I want to be a rock star, but I'm not going to be a rock star, so I don't know what I want to do." Well, what about that do you love? You love music, you love instruments and you love that world—you can be part of that as a lawyer, as an accountant, as an electronics engineer... there's any number of ways you can be part of that world.

"And that's one of the things I love about engineering. It gives you a great foundation that you can take and go anywhere you want with it. It's in the way that you combine these things that you can really make magic happen in your career."

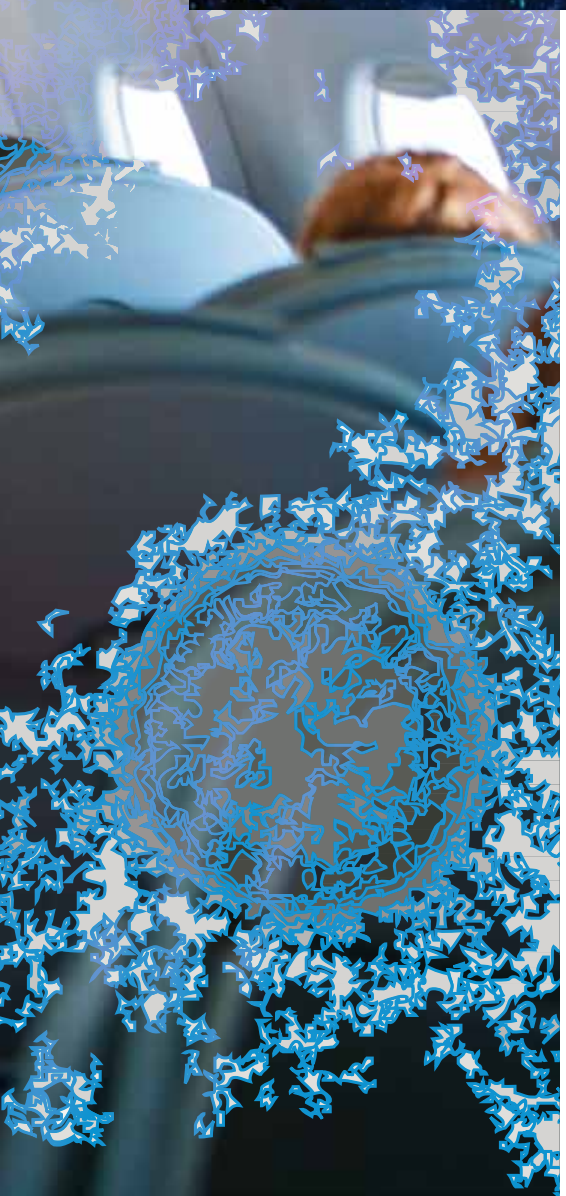
Darren Zenko *is an author, video gamer and freelance writer living in Edmonton.*

Doug Walkinshaw (PhD Mechanical '70) has played an influential role in indoor air quality in Canada and around the world, earning professional accolades and a U of A Alumni Award.

The air that you breathe

Doug Walkinshaw has had a major impact on indoor air quality across Canada, and around the world

by Richard Cairney



Blair Gable

During an age in which fears of global pandemics run at a fever pitch, we're more aware than ever of our surroundings and public health threats. We wash our hands compulsively and shun our coughing co-workers. So at the peak of flu season, where would you rather be: on a packed bus or subway car for 30 minutes, or in an NHL arena watching your home team go into a thrilling triple overtime game? Remember—it isn't a question of which is more entertaining. You may enjoy people-watching on public transit more than the Edmonton Oilers' inevitable victory over the Calgary Flames. The question focuses on which environment you'd feel safer in, from a public health standpoint. So? Which would it be?

Few of us would choose the crowded subway car. All those bodies crammed into such close quarters? Ugh. If ever there were a probable epicenter for airborne disease transmission, this would be a hot zone. But Doug Walkinshaw (PhD Mechanical '70) would pay his fare and step aboard the subway without hesitation. "The arena is a bigger risk because the exposure time is potentially so much longer and therefore the number of viruses inhaled, on average, substantially higher-in fact, eight times higher," explains Walkinshaw, an internationally renowned expert in indoor air quality. He introduced the idea to ventilation engineers that the integral-of-exposure-with-time might be a much more important indicator of air quality than air-exchange-rate and instantaneous concentration. "Being exposed to an infectious aerosol from the exhaled breath of a sick person for a half-hour on a crowded subway car is a less dangerous setting than in a crowded hockey arena for five hours."

It's counterintuitive, but in an upcoming research paper Walkinshaw calculates that one sick person in a group of 40 can spread many more germs through the air over five hours than he or she can over 30 minutes in tighter quarters. Duration of exposure, ventilation rate per person, occupancy density and air currents are the key considerations, he says. "Of course if you are directly coughed on by an infected person in either setting, all bets are off."A summary of his calculations of

exposure risk for thirteen common settings, along with the exposure duration used, appears on page 17.

The irony of Walkinshaw's research is that he will be flying to present his findings at an international conference in Kuala Lumpur this November. And transcontinental flight is an even riskier proposition. When it comes to airborne pathogen exposures, jetliners make crammed subway cars and hockey arenas look pristine. "Ten to 15 hours on a long-haul jet with a person onboard with the flu, or worse still, TB, is the highest risk exposure investigated," says Walkinshaw.

When it comes to airborne pathogen exposures, jetliners make crammed subway cars and hockey arenas look pristine.

There are countermeasures you can take—but we'll get to that later.

Walkinshaw has decades of experience in his field. He led the establishment of the National Research Council's first indoor air quality research program in 1982, contributed to the development of Health Canada's first indoor air quality guidelines in 1987, and a year later acted as a scientific advisor to the World Health Organization in drafting sick building syndrome guidelines. He was selected by his international peers as President of the 5th International Conference on Indoor Air Quality and Climate held in Toronto in 1990 with over 500 technical presentations and papers. He was a co-founder of the International Society of Indoor Air Climate and the International Academy of Indoor Air Sciences, and elected a Fellow of the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

Today, Walkinshaw is owner of three companies: Indoor Air Technologies Inc., ECHO Air Inc. and VEFT Aerospace Technology Inc. The first leads his investigations and his basement ventilation technology implementation. The other two spearhead development of his ventilation technologies for aircraft and related spin-offs. He has received numerous accolades and this fall will be presented with the U of A's Alumni Honour Award in recognition of his contributions to society.

These are remarkable achievements for an individual who never planned to enter the ventilation and air quality area. After earning his Bachelor's and Master's degrees in civil engineering and engineering mechanics and his PhD in mechanical engineering, Walkinshaw began work in structural dynamics and shock and blast physics while working for the Department of National Defence at Defence Research Establishment, Suffield. There, he conducted a structural safety analysis for the proposed Gentilly nuclear plant in Quebec that helped win its approval, and was involved in the blast hardening analysis of the Canadian DDH 280 Iroquois class destroyer series built between 1964 and 1972. In 1972 he joined Public Works Canada, where he directed its new technological research and development program for buildings, bridges and marine structures, coincidentally heading the government's building energy conservation research program during the 1979 energy crisis follow up. In 1982 he joined the National Research Council (NRC) to oversee its urea formaldehyde foam insulation (UFFI) research being conducted by three of its research divisions and began an indoor air quality research program in the Building Research Division. There, he uncovered some alarming practices that put people's health at risk in the name of conserving energy, and began to specialize in indoor air quality.

"Everyone started boarding up air intakes to ventilation systems on building roof tops and sealing house air leaks to save energy. You draw in fresh air and you have to heat it, cool it, humidify it—all that takes up energy—and the field of indoor air quality versus energy conservation was born and became an emerging public health issue "

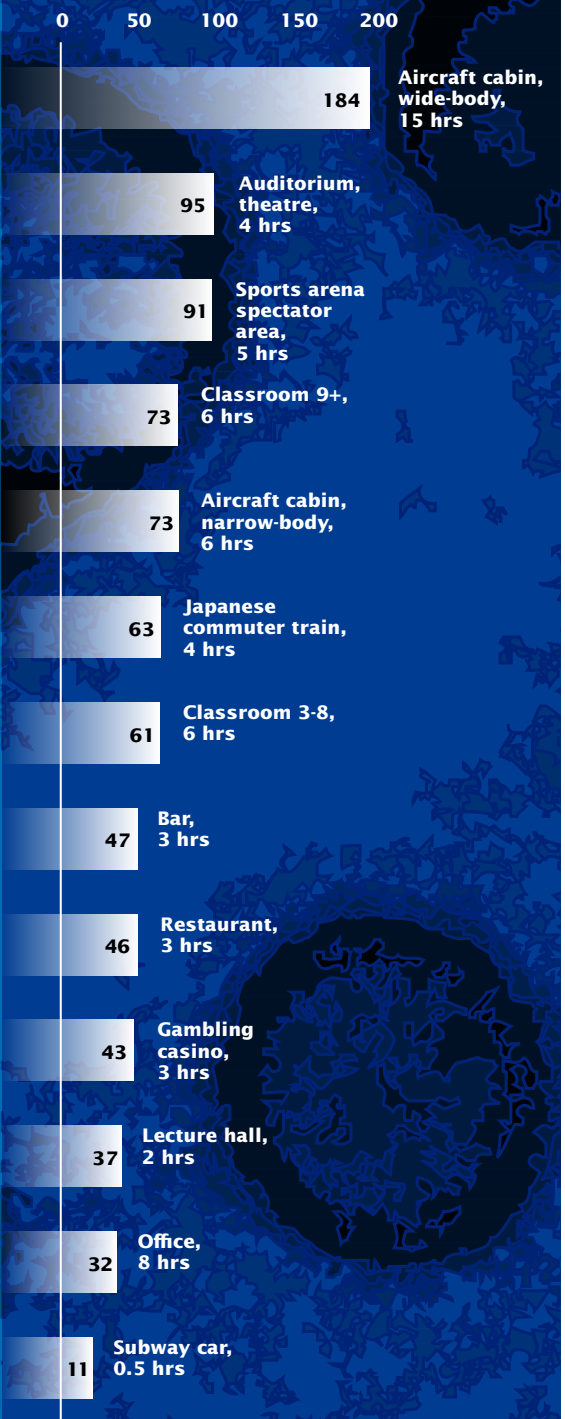
Nationally, the debate about the off gassing of formaldehyde from UFFI raged on while Walkinshaw began learning everything he could from colleagues in the NRC's Fire Research Centre—particularly how to measure trace quantities of volatile organic compounds (VOCs). Walkinshaw and his fire research colleagues discovered that photocopiers at the NRC Canada Institute for Scientific and Technical Information library were a major source of VOCs. These machines were spraying a petroleum-based toner dispersant which wet the entire page in order to apply the print and the paper was then heated to dry it, putting a characteristic fingerprint of n-nonane, n-decane and n-undecane and other VOCs into the air. Over the course of a year more than 100 gallons of these isoparaffinic hydrocarbons were emitted into the air of the library to be breathed by occupants and taken home on clothes and hair. It turned out that this same photocopier type was widely used in Canadian schools and government offices. Its manufacture and use has since been discontinued.

Walkinshaw has conducted over 300 investigations in buildings, homes and aircraft. His most extensive investigation was of the McDonald-Cartier Building in Kingston. This building houses the Government of Ontario employees who process Ontario's Medicare payments and produce its wallet-sized plastic driver's licenses. It opened in 1979 and soon after, workers began to complain they were getting sick. Between 1988 and 2002, before his investigation, there were seven different studies made of the building air and three studies of coal tar migration near the building raising the concern that toxic tar fumes were entering through the foundation. Walkinshaw conducted a three-year investigation into the building's air quality beginning in December 2002, uncovering multiple air quality problems and hazards leading to an $11-million renovation.

Although there were suspicions that the site's landfill materials and its proximity to a former coal gasification plant with coal tar found oozing through the fissures in the limestone nearby, "the main chemical in the

Influenza Viruses Inhaled

Number of influenza viruses inhaled during at rest, awake, tidal breathing in the 13 environments by groups exposed to the exhaled breath (coughing not incuded) of one infected person based upon design (maximum) exposure time, fresh air ventilation, filtration and occupancy denisty differences.



Source: Walkinshaw, D. "Germs, ventilation, occupancy density and exposure duration, a thirteen setting pathogen inhalation comparison", American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) conference proceedings IAQ 2010.

air of that building was from photocopiers and the main problem was from respirable dust tracked in on footwear and deposited under desks on the wall-to-wall carpet and aerosolized by vacuuming and foot movement," he says. "And that is typical of many office buildings. Photocopiers should be located in special rooms that are air sealed and exhausted directly to the outdoors. There really should not be carpet in office buildings but if there is, the desk chair and occupant's feet should rest on a plastic pad over the carpet."

Walkinshaw also conducted groundbreaking environmental tobacco smoke research at three prisons, which ultimately led to a ban on smoking in all Ontario prisons—a first in the country. The move was heralded as a major public health victory for both guards and inmates: today, smoking is not allowed in any provincial or federal prison.

Another study, in a public school, found significant sorption by the children of 1,4 dichlorobenzene, a leukemogen whose source was the disinfectant and odorant used in washrooms.

On the residential front, Walkinshaw has developed technology to solve basement cold and dampness problems and prevent soil gas entry. His ECHO System technology uses an energy efficient continuous-duty blower to depressurize and vent air from behind specially constructed tightly sealed walls and a thin, low-emissivity subfloor to the outdoors. A similar envelope pressurization system has been developed for aircraft, where cabin humidity will condense and freeze behind the wall liner on the cold fuselage during flight and then melt on the ground, creating dead weight, microbial growth, reduced insulation performance, metal corrosion and electrical failures.

Back to that transcontinental flight to Kuala Lumpur: Air quality on airplanes is a serious public health issue that Walkinshaw is working on. Studies have shown that the common radius of airborne spread of infectious agents is at least six rows in either direction of an infected person. However, aisle seats and seats near lavatories are more prone to air currents generated by people moving in the aisles and, therefore, more likely to be exposed to airborne pathogens from an infected person. Today, Walkinshaw is working with a Boeing colleague to design safer 'gasper' overhead climate control nozzles for aircraft passengers. This technology is currently in the early patent protection stage, but according to his Boeing colleague promises to eventually guide the direction of future design. Currently, the air from these gaspers draws ambient air into their flow, increasing the chances of the spread of pathogens from neighbours when pointed at the face. The design Walkinshaw and his Boeing colleague have developed would still draw that ambient air—but it would be filtered first before leaving the nozzle.

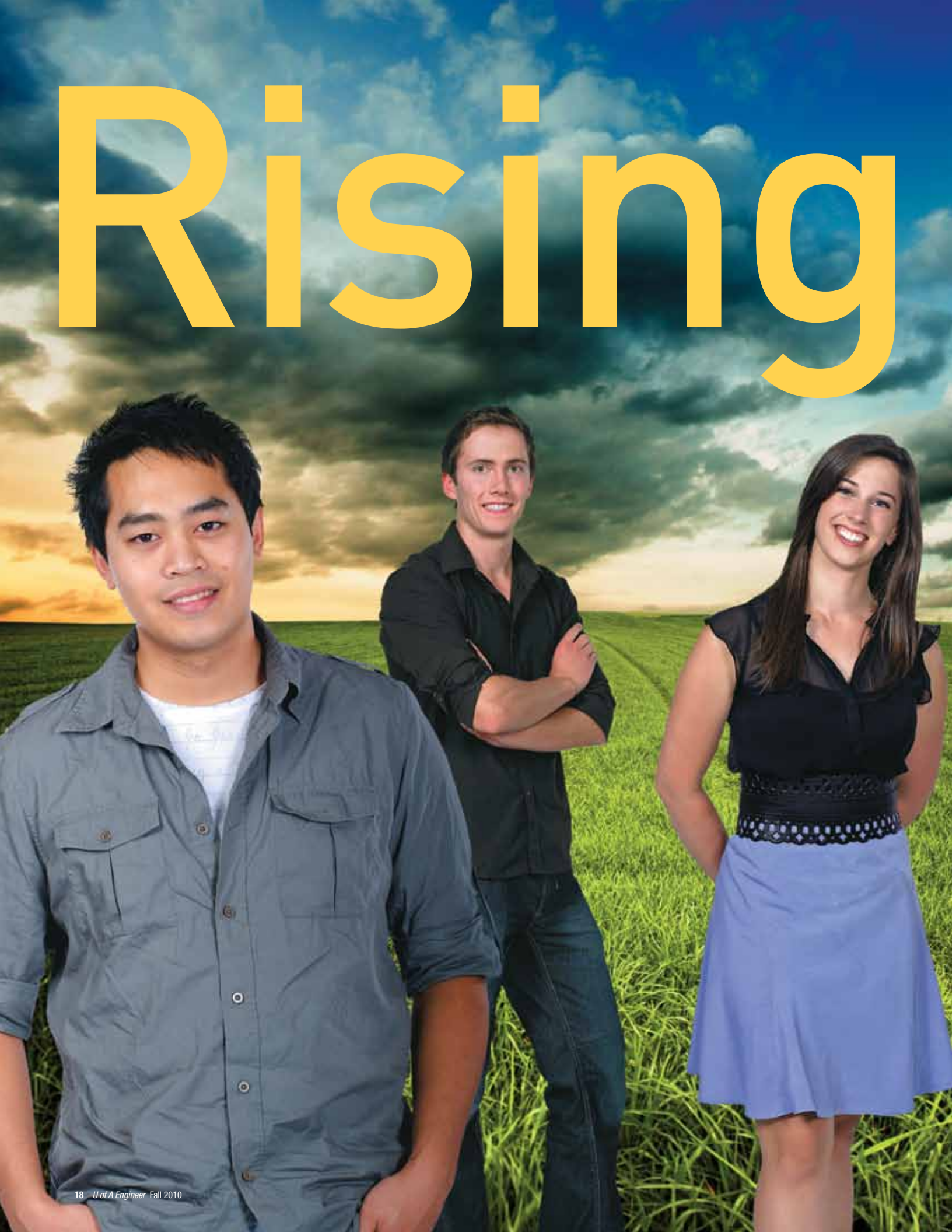
"The air flow from the new nozzle would be more like that from a large shower head than from a jet," he explains, adding that there are measures you can take personally in the interim to reduce the risk of airborne infections while onboard an airplane. Walkinshaw advises people to choose window seats over aisle seats and try not to sit near the washroom. And as for that overhead air nozzle? Never point it directly at your face, he warns—but do use it to create a protective curtain between you and your neighbour, coincidentally entraining and drawing any germs to the floor of the cabin where they will be exhausted to the outdoors or filtered before the air is recirculated.

"If your plane has overhead personal air outlets, turn on the outlet and direct it between you and of the neighbor you are most concerned about from a potential infection viewpoint, pointing it between the two of you toward the floor."

Whether it's practical tips like these or planning and carrying out investigations that span years, Walkinshaw has had a tremendous impact on public health. But he hasn't really stopped to consider that—he's too busy working towards new solutions to pause and reflect on it.

"I don't have any idea of what impact I have had," he says. "I'm still working. There's still a long way to go—I'm not sitting back." With several patents pending and under development and clients waiting for his indoor air quality investigations and solutions, he certainly is not.

Rising



STARS

BY RICHARD CAIRNEY

A year ago *U of A Engineer* began an annual feature that profiles new graduates and checks the pulse of young engineers one year after convocation. It's an exciting project, and one that reminds us all how rapidly things change early in our professional careers.

Jimmy Jeong / Trudie Lee

The lives of alumni who graduated a year ago have been transformed. They have taken their engineering education and applied it to everything from practical, work-based problems to more personal challenges about the direction they want to go in life. Our brand-new graduates, meanwhile, are looking forward confidently to rewarding careers and looking back, appreciatively, on their engineering experiences.

Daryl Tran, Mark Hlady, Hilary Costello and Bobby Williamson are among this year's new alumni.

Rising Stars

BOBBY WILLIAMSON

An epic recovery

There is nothing as dreadful as the sinking feeling you get when you're in the middle of flunking an exam. Bobby Williamson (Petroleum '10) remembers that feeling too well.

"In April of 2006 I was taking a Math 201 exam that had four questions," he recalls. "Each required a full page of calculations. I had nothing."

It was emblematic of an "epic fall from grace" for Williamson. He graduated from high school with honours and 150 credits. But in Engineering, the unthinkable happened: he flunked out during his second year.

"Try explaining that to your dad," says Williamson, whose father holds an honours degree in physics, is the manager of process engineering at Edmonton's high-tech firm Micralyne, and supervises more than a dozen engineer physicists.

Williamson took a year to work and travel, and realized he should embrace the opportunities he had in life.

He was re-admitted on probation the following year. During his second-last semester, he pulled off a perfect 4.0 GPA, even while playing intramural sports, taking dance classes, and cartooning for *The Gateway*.

"I came back with a whole new attitude. The program kicked my butt and I had to show it the respect it deserves," he says.

Graduating with a degree in petroleum engineering during an economic crisis isn't the best of timing, so Williamson plans to do some more travelling.

"Eventually the jobs are going to be there. Travel wasn't my first choice, but the opportunity is there."

And Bobby Williamson isn't the type who squanders opportunities.

DARYL TRAN

New beginnings for student leader

Few people complete a university degree with the knowledge that they had an impact on the experience of hundreds of other students.

Daryl Tran (Electrical '10) became involved with student government by volunteering for different Engineering Students' Society activities during his first year. In his second year, he was elected to the ESS position of First-Year Liaison, helping new students fit into student life.

You can see where this is going.

In his third year, Tran was elected as a vice president of the ESS. He later served back-to-back terms as its president, adding a fifth year to his studies to ensure his success as a student and a student leader. He served as a national councillor with the Canadian Federation of Engineering Students, helping to compose its first-ever position letter to Engineers Canada and the federal government, urging sustained funding to post-secondary education as the global economic downturn began.

If Tran could say he earned a minor, it might be in team building, time management, and communication.

After taking time overseas to decompress and get away from the hectic pace he'd been keeping for five years, Tran is now considering his professional options. It doesn't matter much to him that jobs are scarce; he feels confident, equipped, and ready for anything.

"The engineering degree is one of the most diverse," he says. "I'm not worried at all. I'm confident in my abilities, and there is no point worrying about things that are out of your control anyway."

HILARY COSTELLO

Return on investment

Hilary Costello put as much effort into her engineering education as humanly possible—and that approach is evident in everything she's gotten out of it. Costello (Mechanical [Co-op] '10) has a wide variety of industry experience, has studied internationally, and has delved into research projects.

Now, having won the Faculty of Engineering's prestigious Churchill Scholarship and a Canada Graduate Scholarship from the Natural Sciences and Engineering Research Council, she is heading to Cambridge for her PhD.

Costello credits her "anything's possible" attitude to some valuable advice she received in her first term. "They said that going into Co-op was a good way to try different things. So that's what I did. I worked in oil and gas and that is obviously a good industry, but I went out of my way to try different things, too."

That included working on a Dean's Research Award project as an undergraduate, and taking part in an exchange program to the University of Freiberg in Germany. Her co-op placements included Husky Energy, B.C. Hydro, and Suncor's wind energy group.

At Cambridge, she intends to immerse herself in renewable energy studies. And she still believes anything might happen.

"I've always thought I would enjoy being a professional engineer but I always wanted to do graduate studies to find out if I would enjoy working in academia," she says. "I wanted to see how far I could go and explore the different possibilities that lie ahead. I'll just have to feel it out over the next few years."

MARK HLADY

Taking care of business

Mark Hlady (Materials '10) had to solve a problem: should he study commerce, political science, or engineering? "I was interested in so many things," he says. "I knew I couldn't go from politics to engineering or from business into engineering. But if I took engineering, I could go into either of the others. Engineering was the most versatile."

During his third year of studies Hlady won the Peter Lougheed Scholarship, one of the U of A's top awards for academics and leadership. He was excelling academically and served in a number of student groups as well. With the Canadian Federation of Engineering Students, he initiated a project to highlight the social impact of engineering to students who might not otherwise consider studying engineering.

Ironically, he still wasn't sure what he wanted to do in life, until he wrote a test and applied for a job with the high-powered management consulting firm McKinsey & Company. In September, he began working with them in Calgary as a business analyst.

So what advice can a young man with a fresh undergraduate degree in Materials Engineering offer the leaders of Fortune 500 companies?

"The analytical and thinking skills that engineering helped me to develop," he states plainly. "Over four years in engineering, you learn how to think. I know how to approach problems and which questions to ask to help develop solutions.

"I almost didn't believe in the idea of finding your passion, but through all the things I have done here, I have finally found what I was looking for."

One year later...

JIM MURPHY

On top of the world

A year ago, Officer Cadet Jim Murphy graduated with his degree in electrical engineering at the age of 43. In the past year he has been promoted two ranks, to Lieutenant.

Speaking on the phone from the northern tip of Ellesmere Island in the Arctic, Murphy is marveling at the scenery, excited about where his engineering education has taken him.

Now based in Ottawa, Murphy supervises a staff of seven people who are responsible for much of the Armed Forces' communications. One of them, for example, is in charge of the 16–18,000 hand-held walkie-talkies used by military police and firefighters. Another looks after air traffic control communications. Another takes care of the High Arctic Data Communications System, part of which is spread across mountaintops on Ellesmere, where Murphy was inspecting communications equipment.

Usually, he works at a desk, handling budgets and reviewing inventories and ensuring the people he supervises have the resources to get their jobs done.

"I took the Financial Management for Engineers course," Murphy says. "It directly applies to what I am doing. We cost out the life cycle of these fleets and keep in mind the value of these assets."

Up on Ellesmere, he handles whatever comes his way. "The equipment I was working with today is exactly what we were building in our labs. I walked into a building the other day and looked at a piece of equipment—and if I hadn't taken that wave guide course, I wouldn't have known what was going on with it."

REBECCA PINTO

The importance of perspective

When Rebecca Pinto (Chemical [Co-op] '09) finished her engineering degree, she had firm plans to continue on to medical school.

"Things have really changed for me," she says today. "I've basically done a 180."

Understandably, Pinto wanted a break after earning a 4.0 GPA as an engineering student. She took a year off, visiting family in India, applying to medical schools and reflecting on the kind of life she wanted for herself.

"I hadn't been enjoying life as much as I wanted to. I was just pushing so hard to finish my degree, and I realized I didn't want to do that for the next seven or nine years of my life," she says.

This fall, she began a 16-month master's degree program in energy strategies at École des Mines de Paris. The program includes six months of classes and two five-month internships, giving students insights into legal, political and economic ramifications of engineering in order to help companies—or even nations, for that matter—come up with the best possible energy strategies.

"It is basically everything I could want in a master's program," she says.

"I like seeing how engineering affects society. I don't want to just be in a lab or in one area of engineering. Engineering is so integrated into society that we can't ignore all of the factors companies need to consider when they are making important decisions. This will give me the legal and economic background to help them make the best decisions."

CHRIS PICHURSKI
Diamonds are forever

After graduation, Chris Pichurski (Civil [Co-op] '09) took on full-time employment as an EIT at the Diavik Diamond Mine 200 km north of Yellowknife, NWT. Pichurski had spent his first Co-op work term at the mine and enjoyed it so much he returned there for every subsequent work term.

Diavik is apparently impressed with Pichurski as well. These days, he is working as a ventilation and services engineer, supplying clean air and providing services like compressed air and water to workers in the mine.

But professional life is still a marked contrast from being a student.

"It is a change of pace in a sense that you can't judge what you are doing on such short-term goals like you can in school. In school, you hand in your assignments at the end of the week, and when you get them back it's pretty self-explanatory whether you did well or not," he said.

In the workplace, as a professional, Pichurski is learning there is not always one right answer to a problem—but several. And he's thankful for the experience the co-op program gave him. Having gone through work placements, Pichurski says he has gained the confidence and developed the communications skills that enable him to present a solid case for doing things in a particular way—even if it runs contrary to conventional thought.

Working on a schedule that keeps him at the mine for two weeks at a time, with the following two weeks off, Pichurski is also working towards his master's degree in mining engineering.

MIKE VANDEN HAM
Sink or swim

After graduating, Mike Vanden Ham (Mechanical '09) competed in the World Master's Games in Australia. A former Golden Bears swim team captain, he won a bronze medal in the 50 metre freestyle, then joined a team that won gold in the 4 x 50 relay.

"I'm still competing, but it's nowhere near as intense as it was at the varsity level—that's the real deal. You're putting in 30 hours a week," he says.

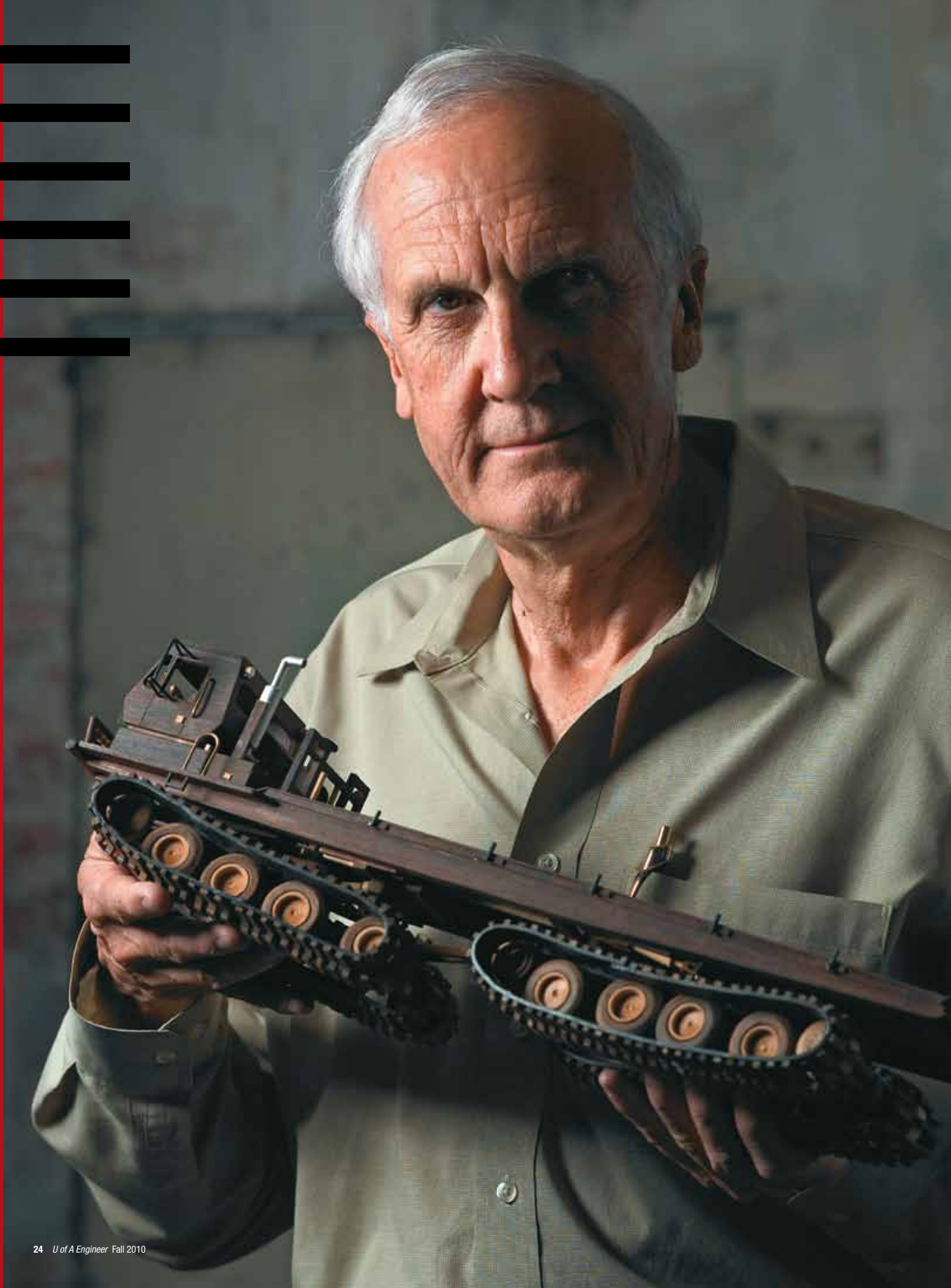
But the majority of his time is still spent on swimming—if he's not in the pool, he is helping others dive in, as provincial registrar for the Alberta Summer Swim Association (ASSA) and head coach of the Huma Summer Swim Club. Returning to Huma for his eighth year, Vanden Ham is keen on continued success with the two-time defending provincial champion swim club.

"I've done these jobs before, I enjoy them, and they were keen to have me back; ASSA has even offered to extend my contract into the fall to complete some project-based work," he says, adding that he is looking for engineering work.

Professionally, his interests have shifted somewhat. He is gaining interest in green energy—he has some connections with a geothermal firm he is looking into. And after being exposed to the "bicycle-oriented culture" he saw in Australia, he is getting more interested in the engineering behind human-powered transportation.

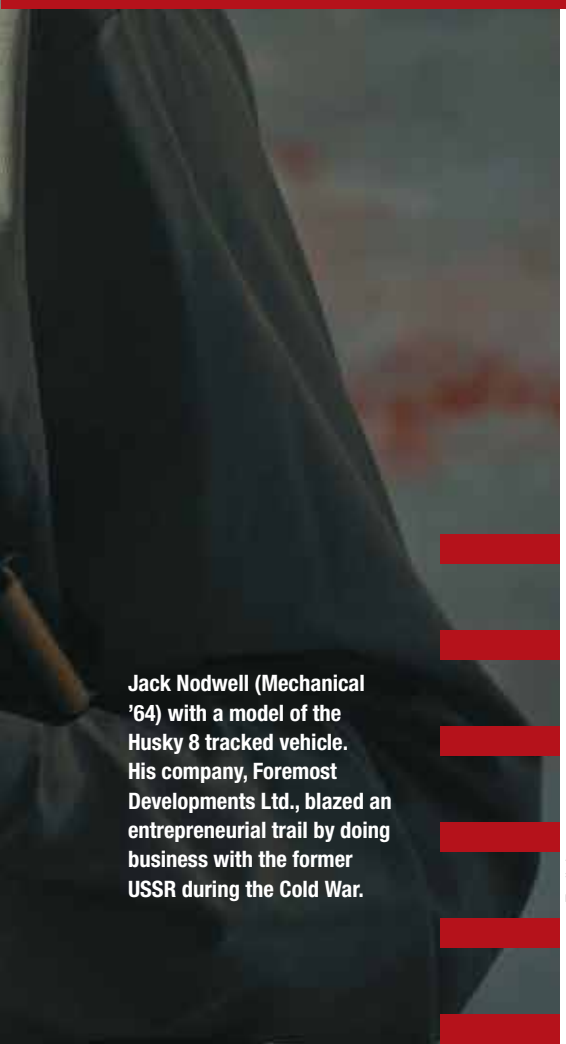
His dream job would still be designing and building in the automotive industry, but Vanden Ham sees other possibilities as well.

"With the movement towards being greener, I think the idea of cycling is becoming more appealing to a lot of people. I am starting to think about that entrepreneurially."



TO RUSSIA WITH TRACKS

COLD WAR WHEELING AND DEALING BY JUDY MONCHUK



Jack Nodwell (Mechanical '64) with a model of the Husky 8 tracked vehicle. His company, Foremost Developments Ltd., blazed an entrepreneurial trail by doing business with the former USSR during the Cold War.

Trudie Lee

Jack Nodwell's recollections of business with the Soviets in the late 1960s sound like details lifted from a spy novel: Coded messages. Constant surveillance. Telex communications transmitted through the Canadian embassy.

In fact, Nodwell (Mechanical '64) was simply trying to get all-terrain, tracked vehicles into the Soviet Union for development of Russian oilfields. His efforts paved the way for other entrepreneurs to follow.

"It was possible to make a phone call (back to Calgary), but it would take a day or two to set up. Then it would be hard to hear because there were so many people listening in," recalls Nodwell, the retired CEO of Foremost Developments Ltd., which began manufacturing tracked vehicles in 1965.

Such working conditions are hard to fathom for today's budding industrialists, accustomed to split-second communication access, wireless technology and powerful computers. But business in a Cold War setting was a very different enterprise, especially when negotiations took place on Soviet soil.

"You didn't ever want to have documents with you that you didn't want the Russians to see. You had to keep all your cost formulas in your head," says Nodwell. He was just 27 years old in 1969 when he set down in Moscow to oversee delivery of the first shipment of Foremost vehicles. The company had put in place a careful vetting process for any communication sent from the Calgary office because "we had to assume they would intercept it. We had to invent codes."

Nodwell and his wife Leila arrived in Moscow in May 1969 for the equipment start-up in Siberia. It was a surreal experience. Foreign business travellers were such a rarity that a senior official from the Canadian embassy met the couple at the airport. Hotel staff were unaccustomed to overseas guests, and the expanded

security check-in took so long, that by the time the procedure was complete, there were no restaurants open for dinner. The couple had brought snacks in case of such an occurrence: crackers and a tin of salmon. As Leila Nodwell unpacked the food in their room, she mentioned to her husband that it would be nice if they had a can opener.

"Five minutes later, there was a knock at the door and there was a woman with a can opener," Nodwell recalls with a laugh.

The incident was not viewed as an invasion of privacy, but the message was clear: there would be no secrets. And while contact with Russian officials was polite and attentive, this was no typical tourist trip. Their movements were restricted. They were not allowed to take photographs at certain locations. They couldn't chat with ordinary Russians—or anyone on the street.

Nodwell describes it as paranoia left over from the rule of dictator Joseph Stalin. "The message was that no one could be trusted. We could go where we wanted to go within certain limits; we just couldn't talk to anyone."

The mindset was deeply ingrained and sharply evident during the early contacts with the Russians, which began in Calgary years earlier. When a Russian delegation came to Canada in 1966, it was to see the Canadian way of exploring for oil. During a visit to the Rainbow oilfield, they spotted the multipurpose vehicles developed by Jack's father, Bruce Nodwell. The two-tracked off-road vehicles were capable of rolling over adverse terrain including muskeg, swamp, snow and sand. The very idea of having such specialized machinery available for purchase was a foreign concept for the Russians, because all mobile equipment used in the Soviet petroleum industry was designed for military purposes, theoretically on loan from the army.

It took until the fall of 1968 before business talks began in earnest. Hammering out details of the initial contract was a grinding procedure: 14 days straight, with talks stretching as long as 12 hours. Nodwell recalls his counterparts' war-like mindset, complete with brinksmanship.

It was a style that caught the Canadians off guard. "Their belief was always that the results of negotiations were that if one party won a point, the other lost. You had to teach them that win-win was the real objective," he says.

But the tough work was just beginning.

The Russians had travelled to Canada because of similarities between the harsh environments of northern Alberta and western Siberia. Yet Nodwell soon learned the oilfields in the Russian hinterland were vastly different. The boggy fields were difficult to manoeuvre through and, for years, getting drilling equipment to location had been a logistical nightmare. Just reaching the initial site was an arduous task: 30 hours by train from Moscow to Tyumen, then three hours north in a propeller plane to reach the oilfield. Rigs were sent by barge on the Ob River, a waterway used in the 19th century to transport prisoners to their final destinations of banishment. Once the barges unloaded their bulky cargo at the town of Surgut, there were still eight kilometres of swamp to navigate to reach the drilling site. Often, the equipment didn't make it.

"Their conditions were tougher than ours," says Nodwell. "Where we were doing oil exploration in northern Alberta, the typical trees are small spruce. Our machines could push them down and make their own path. The trees in Russia were much bigger—harder to push over, harder to break."

He knew right away the job called for bigger equipment. And even though there were no complaints about the initial tracked vehicles, Foremost would build larger models for its second Russian contract.

"You have to remember, they were going through tens of thousands of pieces of equipment each year, busting up machinery or losing it in the swamps," says Nodwell. The Foremost vehicles were much more capable of transporting large loads successfully, and Nodwell made notes for future vehicle development.

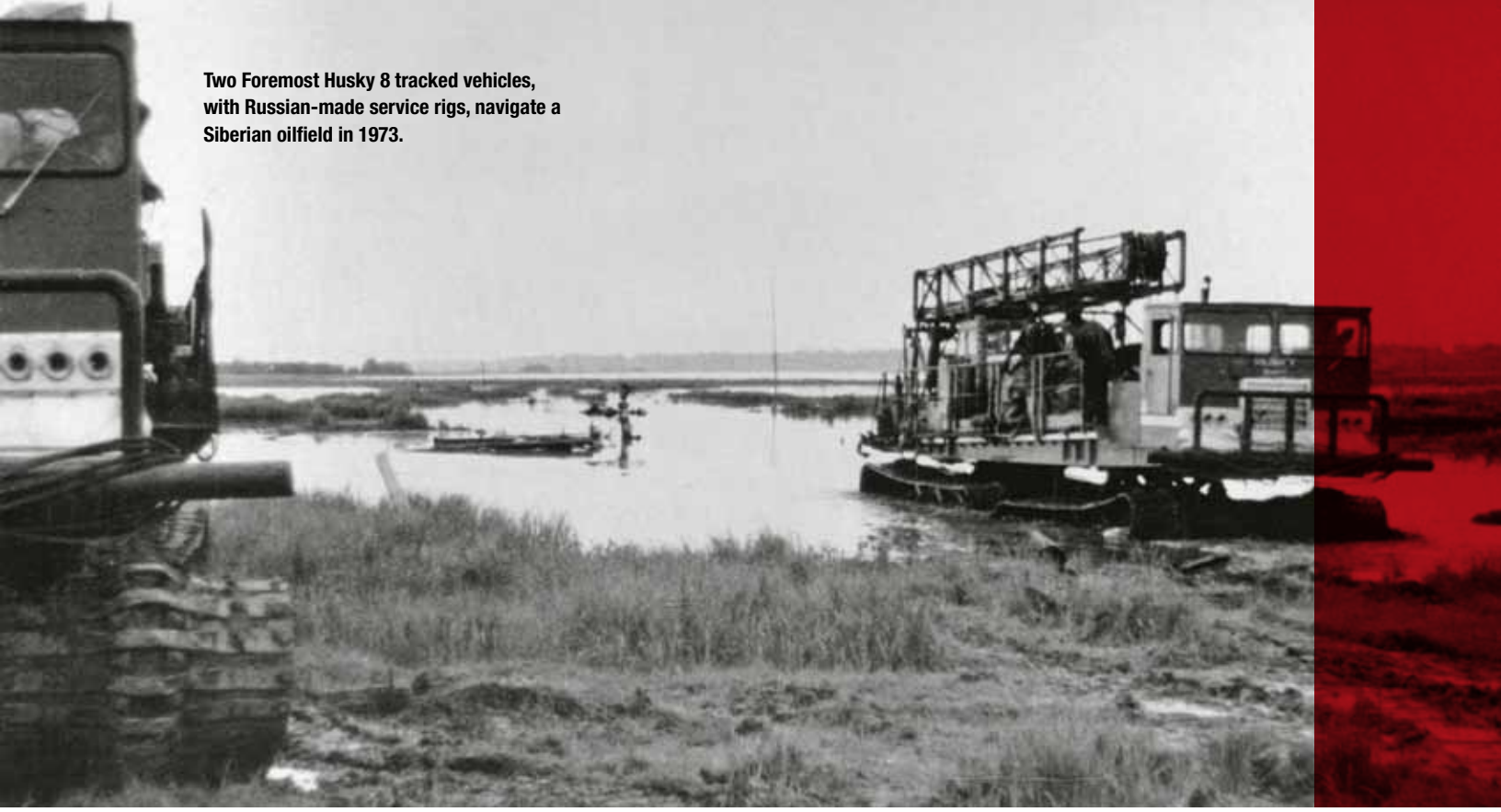
"Their mechanics were good. They all had military background and were used to getting by, substituting equipment if they couldn't get a specific part."

In 1970, Nodwell spent three months in Moscow negotiating a massive deal: the sale of 67 Husky 8s. The large, four-tracked vehicles with 10-metre decks were designed to move heavy payloads in mud, muskeg, snow and swamp conditions.

Again, he found the Russian negotiating style was designed to wear down an opponent. They would only negotiate up to 90 minutes a day and even that was often unreliable.

Courtesy Jack Nodwell

The first Foremost vehicle—the Model 6T—was designed by Jack Nodwell in 1965.



Two Foremost Husky 8 tracked vehicles, with Russian-made service rigs, navigate a Siberian oilfield in 1973.

"Was there a negotiator available? Was there a room available? An interpreter? They might say, 'Meet tomorrow at two' or, 'We'll call you.'"

To avoid going stir crazy in his hotel room, Nodwell would use the Canadian embassy as a makeshift office, telling Russian officials to leave any messages for him there while he ventured around the city. The experience may have been an exercise in endurance, but it also came with another valuable lesson, says Nodwell. "Given enough patience and time, you could close favourable contracts."

In time others followed with their own efforts to do business with the Soviets. In 1971, Nodwell saw hockey czar Alan Eagleson and Montreal Canadiens star Guy Lafleur in a Moscow restaurant. The men were trying to work out the details of what would become the 1972 Summit Series, the exchange of hockey and culture that would forever change Canada's view of the Soviet Union.

"Their agendas were probably a lot more controlled than mine," says Nodwell with a grin.

Foremost always believed the Soviet market had huge potential that made the difficulties worthwhile. Over the years, that belief was rewarded.

"When I look back, this was a big deal, opening up trade with Canada," says Nodwell, who retired in 2003. "There was probably an understanding that if Canada opened up trade relations with the USSR, it could help end the Cold War.

"Many other North American companies had terrible experiences. There were a lot of things that went wrong as time went on.

"But in the early days, long before glasnost and perestroika and the liquidation of the Soviet empire in the late 1980s, what we had going for us was that the Soviet Union wanted to let on that they were good partners. I could say, 'If you don't live up to your contract, you will damage your reputation in Canada. This could ruin you.' Today, you could say that and it wouldn't matter. It was a matter of national prestige and they were willing to make it work, to not screw things up."

Ultimately, the former Soviet Union was the most successful market for Foremost, which sold $750 million (at today's value) worth of machinery over a 35-year period. "It generated a lot of jobs here and opened up Russia to lots of other companies," observes Nodwell.

Over the years, he took other companies to Russia. There were trade missions involving the Government of Alberta and federal officials.

"There were lots of opportunities for Canadian companies to provide equipment, especially oilfield service equipment," he says, adding with a smile: "I'd like to think we had a little bit to do with getting those relationships developed."

Nodwell's sons seem to have inherited the entrepreneurial bug, both creating ventures to serve new markets. Eldest son Keith, a mechanical engineer and president of UCANU Manufacturing, is working on a major prospect for land-based drilling rigs in Abu Dhabi that has impressed energy officials in the United Arab Emirates with its technologically advanced vision. Meanwhile, son Brian's SafetySync Corp. has developed Internet-based software for a total safety management system.

Although Nodwell's career quickly moved from product development to management and marketing, his engineering training gave him problem-solving skills that proved immensely helpful throughout his business career. "With an engineering background, one believes there has to be an answer—either what can be done or what is the best alternative? My activities transferred from technical to strategic over the long term."

Judy Monchuk *is a journalist and author living in Calgary.*

JILLIAN DRESSEL

FROM PANDA TO CONSTRUCTION MOGUL

BY JUDY MONCHUK

The seed for Jill Oborne Dressel's future was planted in Grade 6, when an impressed judge at the county science fair in Cremona, Alberta, declared that the young girl needed to become an engineer. Her project was rather sophisticated and addressed a timely and topical issue in the small farming community: should the town skating rink use natural or artificial ice?

"The idea of the project was sparked when the existing outdoor skating rink in Cremona was covered with a typical metal arena enclosure," she recalls. At the time, artificial ice was too expensive for the town to install, so there was a debate whether the natural ice would last longer inside the new arena or outdoors.

The young Dressel placed containers of ice around the arena, inside and out, and tracked the temperature, colour, consistency and texture, and water level of the ice. The project won at the local and county level and placed highly at the regional fair.

"At the County Science Fair, one judge made the comment that I should be an engineer," she recalls. "I didn't even know what an engineer did."

She certainly found out.

Dressel (MEng '97) is chief financial officer and co-founder of Meade Construction Group in San José, California, a commercial general contractor that works primarily in the high-tech and healthcare construction market. Meade's client list includes Google, eBay, Yahoo, Stanford University, Symantec, Satellite Healthcare, and Sequoia Hospital. That's an impressive stable on its own, but more so when Dressel notes, "89 per cent of our projects to date are repeat clients."

The multi-hat CFO job comes with a litany of duties: Dressel steers projects through the pre-construction stage, creates estimates with myriad details, puts out bids, handles design costs and helps clients stay within their budgets. She manages the budget of each project undertaken by Meade and keeps the company profitable. At 37, she has established a reputation for foresight and action—qualities that helped her negotiate the rocky financial

Roth + Ramberg

Dressel (at the time Jillian Oborne) was part of the Pandas volleyball team that rewrote the CIS record books during the 1990s and was inducted into the Alberta Sport Hall of Fame. Fifteen years after her last university volleyball game, she still holds the record for most solo blocks in a career (99) plus the single-season record of 57 blocks in just 51 games in 1992.

waters of the recent recession. Nearly every construction company in the area was hit hard and, recognizing the need to make decisive and proactive moves and avoid some of the pitfalls that befell others, Meade made some aggressive moves, including the difficult decision to cut salaries across the board.

"The moves didn't spark outrage," Dressel says in an interview from Cremona, where she and her family were visiting relatives during a summer vacation in August. "There's a lot of trust in the company that decisions are being made even though they are very difficult. There's still the feeling that we'll be able to get through this together, and everyone has been able to stay focused on the job at hand. A few folks in the office even offered to reduce their salaries further if necessary."

In the end Meade Construction Group was able to maintain profits through the worst of times. Further, those decisive actions were noted in Dressel's nomination as Silicon Valley's 2009 CFO of the Year. The nomination letter stressed that Dressel's abilities and accomplishments would be laudable in a Fortune 500 executive with 30 years of experience, much less a first-time CFO.

"Financially navigating a company through a major recession is a difficult chore for any CFO. In the construction industry the task becomes Herculean," the letter states. "Jill not only accomplished this feat, but did so while simultaneously performing the role of chief estimator, a position at which she is widely acknowledged to be among the best in Silicon Valley." Meade had grown to $55 million in 2008 and has been named to the list of Fastest Growing Private Companies in Silicon Valley three times.

It's an impressive review, but perhaps not surprising given Dressel's background.

A recent U.S. citizen, Dressel retains her Canadian modesty about her accomplishments. She prefers to stress the positive attributes of office teamwork and credits her success to lessons learned at the U of A, where she was an all-Canadian scholar and athlete. Dressel (at the time Jillian Oborne) was part of the Pandas volleyball team that rewrote the CIS record books during the 1990s and was inducted into the Alberta Sports Hall of Fame in 2002. Fifteen years after her last university volleyball game, she still holds the record for most solo blocks in a career (99) plus the single-season record of 57 blocks in just 51 games in 1992.

Dressel says the athletic background taught her the time management and interpersonal skills that have brought her so many workplace accolades. She learned lessons in communication and teamwork on the volleyball court, in games and in practice. Knowing that each individual has different talents, and appreciating how those contribute to creating a special whole are concepts easily transferred to the construction industry, she says.

But the most important lesson was learning how to stay calm and multitask. Preparing for an ever-changing opponent is not that different from handling the changing parameters of a project or, perhaps, a collapsing economy.

"We're going after a common goal, and realizing that everyone has something to contribute to the end result," says Dressel. "People have different skills. When you put them together as a team, you can have amazing results."

When interviewing potential staff, Dressel looks for people who have succeeded in team settings. And she notices a difference between those who have triumphed in individual or team sports.

"If you hire smart people you can teach them skills, but it's hard to teach them teamwork skills," she says. "People who have been successful in team sports seem to be able to work with others well."

Dressel acknowledges the rarity of being a woman in a senior construction role, but prefers to sidestep the issue. She opted to pursue a degree in civil engineering because it would allow her to create something tangible, yet it was helping to build a "green" house for one of her high school teachers who piqued her interest in construction.

She entered the master's program in construction engineering and management, which allowed her to work with Simaan AbouRizk, an NSERC Senior Industrial Research Chair and professor widely known for his work in productivity estimation and risk analysis for capital projects. Graduate students did research for Edmonton-based construction giant PCL, and Dressel's work with PCL convinced her she would enjoy the field.

"A lot of people have these pre-conceived notions of construction," she says. "It's a lot more than someone in a pickup truck. It's so technical. There's a great deal of pre-task planning that goes into projects. There's lots of critical thinking and that's what ultimately attracted me."

She headed south during the height of the dot-com boom in 1996 to be with her future husband, U of A alum Kendon Dressel, who was pursuing his doctorate at Palmer College of Chiropractic in San José. It was supposed to be a short-term stint in the Silicon Valley, but within three days of landing in southern California she was offered a job at Devcon Construction, where she stayed for a year until being recruited by DPR Construction. There, she rose quickly through the ranks, going from engineer to project manager.

Dressel, husband Kendon and their daughters Ayla and Nicole visiting Jillian's hometown of Cremona, Alberta.

"I was fortunate to arrive in the Bay Area during the tech boom, where there seemed to be endless career opportunities. Although Alberta has certainly had its share of booms, it's doubtful the same opportunities would have presented themselves."

At 27, Dressel was appointed to oversee a $250-million, 14-building campus development for Sun Microsystems in Newark, Ca. The 2-1/2-year assignment would change her life.

"I was honoured to be given the opportunity to work on that project, with such an amazing team," Dressel says. "It went well on so many different levels: budget, schedule, quality, safety, and teamwork. We had such synergy on that project. Everyone seemed to be so good in their roles; it just meshed together so well."

Usually, when a major construction project ends, the team disbands and each specialist goes on to another job with new challenges and new faces. But several members of the team on the Sun Microsystems project agreed they had found lightning in a bottle and wanted to hold on and see what it could develop on a longer term. "We realized we really had something special on that project," says Dressel. "We tried to get back together. That was how we started Meade Construction."

The company was launched in 2004, just as Dressel gave birth to her first daughter. But that didn't slow her down. "I was definitely a working mom," she says with a laugh. "In the early days, I would occasionally take her with me, tucked into her Snugli, when I went to meetings with bankers, accountants, architects—she was great."

Dressel says that juggling school and sports in university taught her how to balance an incredibly hectic work and family life. "I always found I felt better when I was doing both," she says. "The skills I learned in university have been instrumental in balancing my work and home life."

Retaining this balance, being able to have it all, is what Dressel counts as her proudest achievement. "I'm able to make the day seamless: spend time with my daughters in the morning, work six or seven hours at the office, then back home for family time."

"A lot of people have these pre-conceived notions of construction," she says. "It's a lot more than someone in a pickup truck. It's so technical. There's a great deal of pre-task planning that goes into projects."

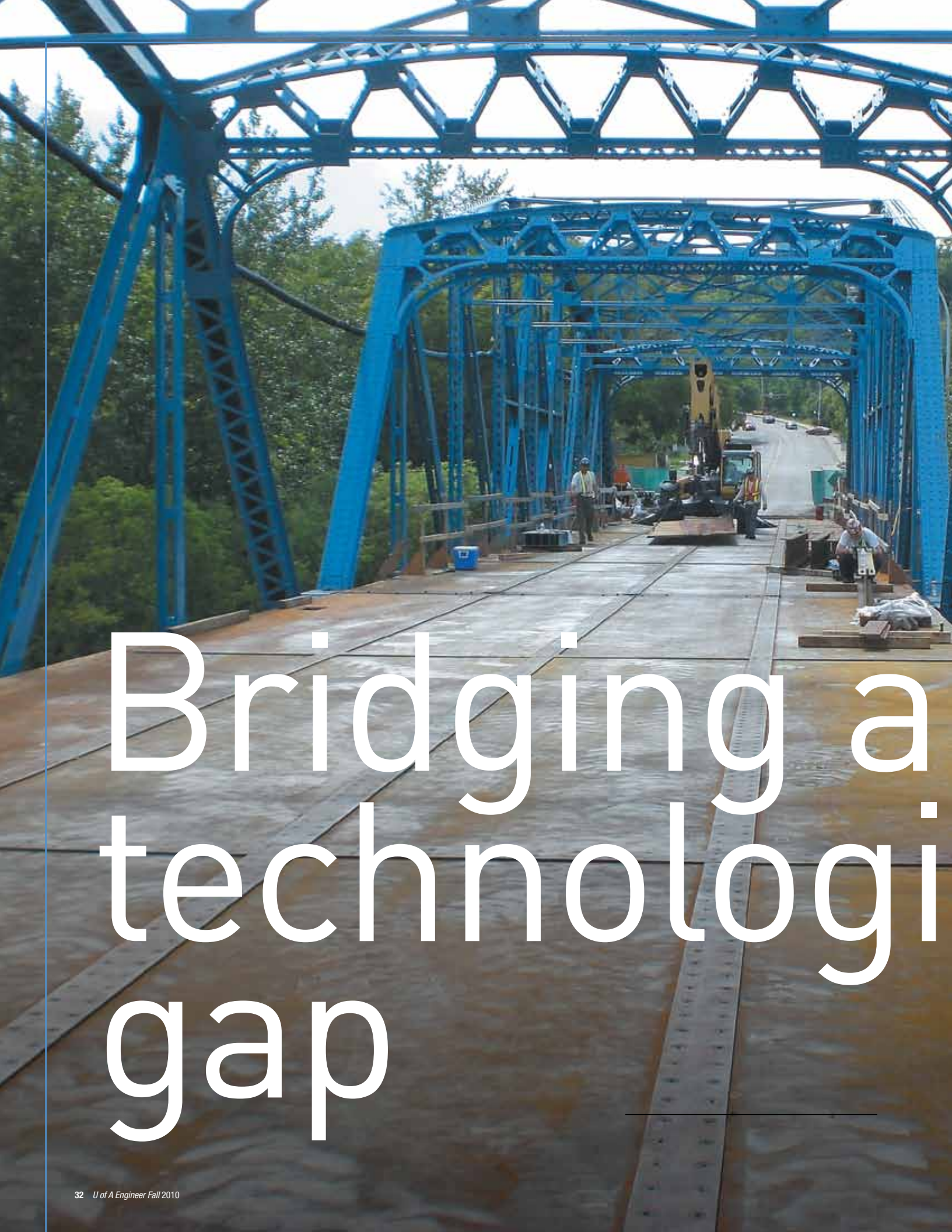
She spends several hours after the girls have gone to bed working on project intricacies in her quiet home office, far from the open-concept bustle of Meade's corporate headquarters.

"I think I'm most effective working in the evening," Dressel says. "That's where I do a lot of thinking and financial analysis."

With her daughters now six and four, Dressel realizes she may have to make some compromises. She has completed two half-Ironman competitions, and had set a personal goal to compete in a full Ironman before her 40th birthday. But, she says, with her children only little once, she may have to put that target on the back burner for a couple of years.

"Ironman is a fairly extreme sport; family, business, and more moderate pursuits are the priority for now," she says. "But I will complete one, maybe even as a family."

Judy Monchuk *is a journalist and author living in Calgary.*



Bridging a technologi gap

cal

Construction on the Dawson bridge in Edmonton features SPS technology for the bridge deck. SPS is at the cornerstone of Intelligent Engineering, run by Faculty of Engineering alumni (L-R) Timothy, Michael, and Stephen Kennedy—and their father Laurie, a professor emeritus with the Department of Civil and Environmental Engineering.

An engineering family is bringing radical change to structural engineering with an innovative new technology

BY RICHARD CAIRNEY

There is an old saying about change: it can be like turning an ocean liner—it takes a long time. But what if you simply rebuilt the ocean liner? In a literal and metaphoric way, that is precisely what a trio of Faculty of Engineering alumni is doing with their company, Intelligent Engineering, and a radical new technology that is revolutionizing shipbuilding and heavy engineering.

Established in the mid-1990s by brothers Michael (Civil '82), Timothy (Civil '85) and Stephen Kennedy (MSc Civil '84, PhD Civil '87), Intelligent Engineering has already become a globally influential player. In a partnership with BASF, Intelligent Engineering has filed more than 80 groups of patents in 82 countries. It has also recently joined forces with South Korea's Daewoo Shipbuilding and Marine Engineering, the world's second-largest ship builder.

What's behind the success? Intelligent Engineering has something other people want: a new technology invented by Stephen, called the Sandwich Plate System (SPS), that is being lauded as the first new materials technology innovation for heavy engineering in 150 years. On the face of it, the idea is simple: SPS is a proprietary composite of polyurethane elastomer sandwiched between steel plates to enormously improve the strength and decrease the weight of traditional construction materials.

SPS technology has received regulatory approval for maritime and civil engineering applications in North America and the European Union. To date, more than 180 commercial projects using the technology have been completed on six continents—there are more than 160,000 square metres of SPS in use around the world.

"At one point you had to go to five continents to find everyone in our family. We had all gone our different ways. I was in business. Stephen was a professor teaching engineering and researching steel structures, and Tim was in the field putting up buildings. And we came back together on this idea that Stephen had developed."

To see an example of Intelligent Engineering's SPS technology, you need go no further than Edmonton's river valley, where an extensive $22-million rehabilitation of the historic Dawson Bridge is underway. The bridge's concrete deck is being replaced with SPS, altering the bridge's capacity dramatically. Consider the following:

- The SPS plate replacing the concrete deck is 45 mm thick. Had the bridge deck been reconstructed with reinforced concrete, it would be 250–300 mm thick.
- SPS is much lighter than reinforced concrete. By laying approximately 2,000 square metres of SPS instead of concrete, the deck weight is reduced by 1,000 tonnes.
- By reducing the bridge deck weight, the load allowance for the bridge can be increased, allowing heavier vehicles to use the bridge.

Engineering work on the Dawson Bridge is being done by Cohos Evamy. Two of the firm's principals, Jeff DiBattista (MSc Structural '95, PhD Structural '00) and Jim Montgomery (Civil '73) examined different ways of rehabilitating the bridge and decided that using SPS was the best bet. The choice is innovative and does represent a departure from the tried-and-true methods of the past.

"The Dawson is an old truss bridge that was originally designed to carry railway traffic across the river for coal mining operations," says Montgomery. During the mid-1980s, the bridge deck was replaced with a cast-in-place concrete slab. Because of the bridge's limited capacity to carry modern traffic loadings, a relatively thin deck slab was used to reduce weight. The deck slab deteriorated quickly, cracking and spalling in many locations. When the city began considering alternatives to update the bridge by replacing the deck and adding sidewalks on each side, SPS technology began to look like the way to go.

At 240 metres long, the Dawson is likely the longest bridge in North America to use SPS technology. After conducting extensive studies, the firm decided to improve the performance of the system by joining the SPS panels together in the field with bolts rather than welds—a measure that should reduce the potential for fatigue cracks from developing under wheel loads.

"It is probably not the only solution, but we feel it is a very good alternative for this application," says Montgomery.

A FAMILY AFFAIR

So, how did it happen that three brothers all became engineers—and that they went on to establish a company that is changing the engineering and construction of everything from ships and bridges to high-rise offices and apartment towers?

Interestingly, a fourth family member continues to play an important role in Intelligent Engineering. Laurie Kennedy, a professor emeritus in the Department of Civil and Environmental Engineering, likely had some role in the fact that Michael, Stephen and Tim became engineers.

"We had him as a professor all our lives—but his name was 'Dad' " says Michael, whose first career was a pilot, flying DC-3s. "Having a father who was a professor of engineering led me to get as far away from universities and engineering as possible," he jokes.

But eventually Michael found himself drawn into the profession, and he has never looked back. While the brothers' academic careers intersected at the Faculty of Engineering, their professional lives saw the trio scattered. Michael earned an MBA in Switzerland and settled in London, England. Stephen was teaching and doing research; and Timothy was more hands-on, working in construction as a civil engineer.

"At one point you had to go to five continents to find everyone in our family. We had all gone our different ways. I was in business. Stephen was a professor teaching engineering and researching steel structures, and Tim was in the field putting up buildings. And we came back together on this idea that Stephen had developed," Michael recalls.

The brothers were together for Christmas when Stephen told Michael about SPS, and that he planned to publish a paper on it. Michael saw commercial potential. Rather than publish, the brothers decided to file patents on the technology and began testing and refining it. After what Michael describes as "literally tens of thousands of tests," the product was ready for commercial applications.

"It's one thing to prove your idea through analysis," he says, "and another to repair a ship in a Chinese shipyard."

Through strategic partnerships such as the one with BASF, the company saw impressive growth. It also recruited an advisory board that looks like a who's who of industry and engineering, including the likes of Sir Frank Lampl, Life President of Bovis Lend Lease; Harlan Ullman, Senior Advisor to NATO's Supreme Allied Commander Europe and former professor of military strategy at U.S. National Defense University; and none other than Laurie Kennedy, professor emeritus—their father.

A former Dean of Engineering at the University of Windsor, Laurie came west in 1981 to work as a consulting engineer. Within a year, the National Energy Program had shelled the province's energy industry and the company's complement of 38 employees had been stripped to just three. Laurie was considering moving back to Ontario when a faculty position in the Department of Civil and Environmental Engineering opened. "It seemed to have my name on it," says

Laurie, who spent the rest of his teaching and research career at the U of A.

Now 81, he is still on the board of Intelligent Engineering—and he brings impressive credentials to the company. The Canadian Standards Association recently presented its first long-service awards, including one to Laurie for 46 years of service. He chaired the national committee that, in 1969, wrote Canadian standards on steel structures for buildings that remain in force to this day.

Laurie says he was thoroughly impressed when Stephen presented him with the idea for SPS because it is innovative in so many respects. The introduction of a polymer is unique, he said.

"I was very surprised when Stephen suggested the marriage of a plastic, a polymer, with steel," he said, adding that working with his sons professionally has been one of the highlights of both his personal and his professional lives.

"I have a problem with shirts," he says. "I'm so proud I keep bursting the buttons off of them. Stephen's invention is absolutely fabulous."

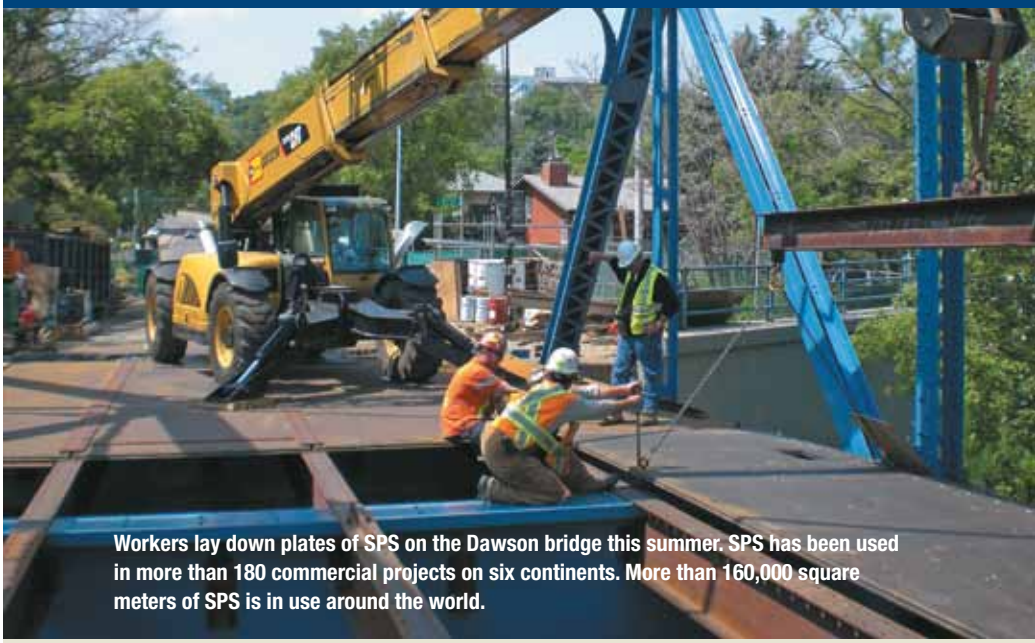
"He has obviously been a great help in many aspects," Stephen says of his father's involvement. "He has over 40 years of experience in research and development and writing codes, like the steel code and the bridge code. He has really guided us and provided us with his expertise."

"The members of our advisory board are exceedingly well accomplished in their field of industry or areas relevant to us, and Laurie is a part of that," adds Michael.

For someone who might at one time have been referred to as a reluctant engineer, Michael chooses an interesting method of describing the family's involvement in Intelligent Engineering.

"On a Venn diagram we have family and engineering in common. At the same time each of us has his own area of expertise and space to contribute," he says. "Now, trying to guide my own children through their early days at university, I would say if you are going to spend your time studying formally, make it worthwhile—and engineering is worthwhile. Even if you don't know what you want to do with your life, it is going to help you."

Alumni web part of Dawson bridge project



Workers lay down plates of SPS on the Dawson bridge this summer. SPS has been used in more than 180 commercial projects on six continents. More than 160,000 square meters of SPS is in use around the world.

The story of the city's rehabilitation project of the Dawson Bridge is highly local, with an international flair and strong ties to the U of A Faculty of Engineering. From the technology being used on the bridge deck to the municipal and private-sector professionals working on the project, U of A engineers have their fingerprints all over the bridge.

The new sandwich plate system (SPS) technology being used on the bridge deck was invented by Stephen Kennedy (MSc Civil '84, PhD Civil '87) and commercialized by Intelligent Engineering, the firm run by brothers Stephen, Michael (Civil '82), and Timothy (Civil '85). Their father, Laurie Kennedy, taught in the Department of Civil and Environmental Engineering and has played an important role in the company, providing expertise on code writing.

At the City of Edmonton, Alan Bartman (Civil '94) , Mike Koziol (Civil '82, MEng '88), Jason Meliefste, (Civil '01) and Byron Nicholson (Civil '84, MEng '87) are among the engineers involved.

Cohos-Evamy principals Jeff DiBattista (MSc Structural '95, PhD Structural '00) and Jim Montgomery (Civil '73) took leading roles in researching different options for the bridge and recommended the city go with the SPS technology. Montgomery adds that there are even more U of A engineers involved.

Cohos-Evamy staff members Neil Robson (Civil '99, MEng '01), and Dan Sune (Civil '07) have had a hand in the project; Megan Lend, the granddaughter of professor emeritus Geoff Kulak (Civil '58) also worked on the project. ("She graduated from Queen's, but she's Geoff Kulak's granddaughter so that's a U of A connection," says Montgomery.)

Coincidentally, Montgomery actually taught Michael Kennedy while Michael was an undergraduate.

"I remember him because he came to my office in late August, before classes started, to introduce himself," Montgomery recalls. "And he was wearing a tie at a time when not a lot of students wore ties."

Montgomery also knows Laurie Kennedy well.

"Laurie Kennedy is a brilliant guy who has done a lot for the steel industry in Canada."

There's at least one current student working on the Dawson project as well. Kris Lima, a Cohos-Evamy engineer, is currently working on his Master's degree at the Faculty of Engineering.

"We actually encourage a lot of our employees who haven't got a master's degree to work on one at the U of A," says Montgomery. "It's a good school."

New teaching centre will educate the next generation of clean energy engineers

the CLEAN team

Jimmy Jeong

A new $21-million teaching and research centre at the Faculty of Engineering will help educate the next generation of clean energy engineers, and will develop new technologies to process minerals, produce clean coal, and reduce greenhouse gas emissions.

The Canadian Centre for Clean Coal/Carbon and Mineral Processing Technologies (C^5MPT) will focus on sustainable development of energy and minerals. The centre was launched June 24.

C^5MPT is led by Qingxia (Chad) Liu, a respected academic who holds an MBA, and two PhDs—in mineral processing and mining, and metal and materials engineering. Liu, a professor in the Department of Chemical and Materials Engineering, has a strong background in the private sector and holds eight patents on commercial applications.

"We will connect basic research and discovery to applied knowledge. We will share information with our partners and speed new technology to the marketplace," says Liu.

With leading-edge equipment and facilities and internationally respected researchers, C^5MPT will focus on three areas of research: clean coal technology, mineral processing technology, and carbon capture and storage technology. Liu says the centre will help bring new scientific breakthroughs to market, through an open-innovation operating model in which research findings are shared with industry and research colleagues. Liu says the centre's discoveries and technologies represent a "push" that match the "pull" of industry.

But there's more than that to the centre according to Liu, who is as passionate about teaching and research as he is about leading the way in sustainable resource development. Those passions brought Liu to the U of A from Chicago, where he spent a dozen years with U.S. Gypsum Corporation.

"You go where your heart and your strengths and your values are," he says. "Through education we can create value for society. I love teaching and innovating, and through that you do service. That is the service of a professor: you give back to the community. Educating the next generation is really rewarding, and in doing this you give back—you can create a better life through what you give."

Alberta, he explains, is blessed with both a wealth of resources and pristine wilderness

Qingxia (Chad) Liu, a respected academic who holds an MBA and two PhDs—in mineral processing and mining, and metal and materials engineering—leads the Canadian Centre for Clean Coal/Carbon and Mineral Processing Technologies (C^{5}MPT).

—and has an obligation to develop its resources as responsibly as possible.

"We have to let people know we are responsible, that we continually innovate, that we continue to raise the bar to the next level, that we always try to do better," he says. "One of the key forces that attracted me here is the future."

Liu sees the centre's future as a hub of activity that contributes to the province's well-being by creating both intellectual and human capital.

"Being sustainable means that you consider the economy, the environment and the community. The centre is going to create human assets—not only in research infrastructure but also in the form of intellectual infrastructure. It will educate future engineers—this is critical to the centre."

Dean of Engineering David Lynch says C^{5}MPT will be a global centre, taking advantage of existing partnerships with government, funding agencies, industry, and research centres around the world.

"Our vision is to become a world-class research centre and innovation hub in clean coal/carbon and mineral processing technologies," says Lynch. "By providing the basic research foundation we can promote the development and upgrading of Alberta's natural resources in an environmentally responsible manner."

Support for the research centre, which includes several named research chairs and professorships, comes from the Government of Alberta through Alberta Innovates—Energy and Environment Solutions and industry partners Capital Power Corporation, Teck Resources Limited, Hatch Ltd., Nexen Inc., and Foundation CMG.

Partnerhsip will focus on SUSTAINABLE OILSANDS PRODUCTION

German research centre adds capacity to research production

The Faculty of Engineering is playing a major role in a partnership between the U of A and one of Europe's largest scientific research organizations, aimed at increasing the sustainability of Alberta's oilsands resources.

The U of A and the Helmholtz Association of German Research Centres have entered a five-year agreement—The Helmholtz Alberta Initiative (HAI)—to transform oilsands production processes by developing technologies that address sustainability.

"The announcement brings together our international leading research in energy and the environment with a truly outstanding international partner," says Dean of Engineering David Lynch. "This gives us an opportunity to take a fully integrated, holistic approach to energy and the environment that addresses all aspects: emissions, water treatment, and land reclamation."

The partnership's goals are to transform oilsands production processes by developing technologies under six themes:

- Advanced upgrading and conversion processes for bitumen and heavy hydrocarbons
- Advanced materials for CO^2 separations in bitumen and coal process streams
- Monitoring technologies for geological sequestration of CO^2
- Replacing natural gas with geothermal energy sources as the fuel for oilsands production processes
- Oilsands tailings water management
- Land reclamation of oilsands and coal mine sites

At the U of A, Faculty of Engineering professors are leading four of the initiative's six research themes, says Lynch—an indication that the Faculty is playing a vital role in clean energy and environmental remediation.

The partnership means that research into oilsands will take on new dimensions. One emerging idea is to use waste from other industries to make oilsands mining and refining more energy efficient.

"We are trying to link oilsands with renewable resources and co-processing them," says Murray Gray, a professor in the Department of Chemical and Materials Engineering. Gray is scientific director for the Centre for Oil Sands Innovation (COSI), and holds the NSERC-Imperial Oil Industrial Research Chair in Oil Sands Upgrading, and the Canada Research Chair in Oil Sands Upgrading.

Gray notes that one innovative research avenue will be to introduce agricultural and forestry waste into the oilsands processing stream.

Other research the partnership pursues, such as air and water purification technology and new separation technologies, could ultimately have applications far beyond the energy industry, Lynch adds.

The agreement should also greatly benefit graduate students. The partnership will lead to the establishment of an international graduate school, in which U of A and German graduate students will take part in international exchanges.

The agreement expands the U of A's current capacity of nearly 50 oilsands-related research projects, by sharing the workload with the Helmholtz Association's staff of 28,000, based at 16 centres across Germany. The association is Germany's largest scientific organization, with an annual budget of 2.8 billion Euros (C$4.4 billion).

The primary Helmholtz research centres involved with the agreement include the German Research Centre for Geosciences in Potsdam, the Karlsruhe Institute of Technology in Karlsrhue, the Forschungszentrum Julich in Julich, and the Centre for Environmental Research in Leipzig.

U of A President Indira Samarasekera signed the Memorandum of Understanding in September 2009 with executives from the Helmholtz Association. "Together, we can push forward with discoveries and innovations needed to reach a sustainable role for the oil sands in helping to meet the global demand for energy," she says.

The partnership received a $25-million shot in the arm from the Government of Alberta in December, 2009.

As it stands the HAI is a five-year agreement, but Lorne Babiuk, the U of A's Vice-President (Research), is already looking beyond that time frame. "Our goal is to expand it and make it a long-term project," he says.

Richard Cairney

Murray Gray, a professor in the Department of Chemical and Materials Engineering and scientific director for the Centre for Oil Sands Innovation (COSI), says the Helmholtz-Alberta Initiative will help develop technology that leads to cleaner oilsands energy.

Survey says...

Readership survey reveals your preferences

A readership survey launched last spring has shed some light on what *U of A Engineer* readers like—and don't like—about their alumni magazine.

Generally speaking, readers are satisfied with the magazine, which is sent to Faculty of Engineering alumni, friends and partners, and is distributed to engineering students. The magazine is intended to strengthen the bond between the Faculty and its alumni, and to spotlight the achievements of Faculty of Engineering alumni regardless of which discipline they practice—or even, in some instances, if they are not practicing engineers. It also gives our current students ideas about the direction their own careers may go. As alumni, you are role models for the next generation of U of A Engineers.

One purpose of the survey was to find out whether the magazine is successful at helping our alumni feel connected to the Faculty of Engineering. Seventy-eight percent of respondents reported that the magazine "Reminds me of my experience at the Faculty", 71 percent said the magazine "Makes me proud to be an alumnus" and 43 percent reported that it "Helps me feel more in touch with my graduating class."

However, 43.1 percent said the magazine "does not reflect my experience at the Faculty", while 31.9 percent said it "does not address topics of interest to me."

One question asked survey participants which of three most recent editions they enjoyed the most, illustrating the question with cover images from editions featuring: the history of the Faculty as the university celebrated its centenary; Randy Marsden (Electrical '89) whose company Madentec has improved the lives of disabled people around the world through the development of innovative enabling technologies; and last fall's cover story featuring four brand-new engineering graduates. Replies to this question were illuminating.

Some readers enjoyed the historical review of the Faculty because it demonstrated how far we have come and our many achievements. Others cited the issue featuring Marsden on the cover because they knew Marsden, or people who had worked for him (in fact, readers generally find that they are more interested in a story if it is about someone they know). Still others said they enjoyed the edition featuring new graduates on the cover because they represent the future. Theses answers echo themes that are fairly consistent throughout the survey: we like reading about people we know, we like history, and we like to read about exciting possibilities that lie ahead.

Other story subjects respondents cited said they'd like to see more of are energy and environmental issues (49.7 percent), profiles of Faculty members (49.1 percent), global-international issues and engineering (48.4 percent) and the pursuits of Engineering alumni outside of their profession (44.8 percent).

An impressive 48.8 percent said the magazine is where they get most of their information about the Faculty of Engineering; 42.8 percent of respondents said they had saved an article or issue and 33.7 percent said they discussed or forwarded an article or issue to a friend or colleague.

Please rate the quality of *U of A Engineer* magazine on the following

	Excellent	Good	Average	Poor
Content	34.5%	50.9%	12.7%	1.8%
Cover	38.2%	49.1%	10.9%	1.8%
Ease of Reading	38.2%	44.8%	16.4%	0.6%
Layout and Design	36.4%	47.9%	13.9%	1.8%
Photography	46.7%	40.6%	10.9%	1.8%
Writing	30.7%	51.5%	17.2%	0.6%

Please indicate the ways in which the magazine strengthens your connection to the Faculty of Engineering

Reminds me of my experience at the Faculty	78.0%
Makes me proud to be an alumnus	71.7%
Helps me to feel more in touch with my graduating class	43.4%
Encourages me to support the Faculty financially	34.6%
Provides useful career and networking information	22.6%
Encourages me to volunteer my time to the Faculty	9.4%

Kudos Taking pride in achievement

BUTLER, BILL PEng
Civil '70

Has been named one of Alberta's 50 Most Influential People by Alberta Venture Magazine. One of his companies, Springwood Developments, has been involved in the development of more than $500 million worth of commercial and retail properties across Alberta in the last decade, including Edmonton's South Point retail area and shopping centres in Alberta's growing suburban and rural communities.

DANIEL, PAT PEng
Chemical '68, LLD (Hon.) '10

Has been awarded an honorary Doctor of Laws degree from the University of Alberta. As president and CEO of Enbridge Inc., Daniel has championed corporate social responsibility and transformed traditional adversarial utility relationships into effective alignments between production, refining and distribution. He was named Resource Person of the Year in 2010 by the Alberta Chamber of Resources.

FORBES, FRASER PEng

Has received the D.G. Fisher Award from the Canadian Society for Chemical Engineering. Dr. Forbes is chair of the Department of Chemical and Materials Engineering at the University of Alberta.

HOWELL, GORDON PEng
Electrical '75

Has been named one of Alberta's 50 Most Influential People by Alberta Venture Magazine. Howell is the founder of Howell-Mayhew Engineering, a leader in innovative clean energy projects such as the Riverdale and Mill Creek NetZero residential projects in Edmonton.

McDOUGALL, JOHN PEng
Civil '67

Has been appointed President of the National Research Council. For the previous 12 years McDougall presided over the Alberta Research Council (now Alberta Innovates — Technology Futures), which expanded its revenues dramatically, to account for three quarters of its $100-million budget.

McNAMARA, GLENN A. PEng
Mining '78

Has been appointed as Chief Executive Officer of Petromanas Energy Inc. From 2005 to 2010, he was the president of BG Canada and responsible for all aspects of BG Canada's business, including developing a growth strategy for western/northern Canada and Alaska. He had previously held several senior executive positions with Exxon Mobil/ Imperial Oil Resources, Exxon Mobil Canada Energy Ltd. and Mobil Oil Canada.

SCOTT, ALLAN PEng
Mechanical '68

Has been named one of Alberta's 50 Most Influential People by Alberta Venture Magazine. As chair of the Art Gallery of Alberta he helped raise millions to build the new gallery—an architectural gem in downtown Edmonton.

XU, ZHENGHE PEng

Has been elected as a Fellow of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM). A professor in the Department of Chemical and Materials Engineering, Dr. Xu also holds the NSERC Industry Research Chair in Oil Sands Engineering Canada Research Chair in Mineral Processing.

Do you have news to share? Send your news of awards, appointments, and other successes to engineer.alum@ualberta.ca

Richard Gavin Reid

On December 9, 2009, the Faculty lost one of its most distinguished alumni, when Richard Gavin Reid (Chemical '49) passed away.

In the 1950s, Reid began his long career with Imperial Oil and Exxon Corporation. Over the years he held the posts of President of Imperial Oil, Executive VP and CEO of Exxon Europe, and ultimately CEO of Exxon International, which is responsible for all of Exxon's operations beyond the U.S. and Canada. He retired in 1988.

In January, at the memorial service held in Toronto, Reid's son Don was touched by the number of Imperial retirees who came to pay their respects. "They all made a point of introducing themselves to my mother, me and my four brothers and sisters, and many regaled us with stories about how my father had touched their lives or their careers. It was a very humbling experience for me."

As inspired as Don was by his father's professional reputation, he's most proud of the way he treated the people around him. "He was a tender man, with a great deal of empathy for deserving people," he says. Don recalls several childhood Christmas Days, when he would invariably accompany his father to Imperial's downtown Toronto office building on some concocted pretext—picking up work, or finishing a project. The true purpose of the outings, however, was to make the sole worker on duty—the doorman—feel needed and appreciated. "On our way out of the building, the doorman would unlock the door and wish us Merry Christmas. Dad would reach into his jacket pocket, retrieve a cigar and hand it to him, touching him on the shoulder with his other hand and softly wishing him a Merry Christmas in return."

Many Albertans associate the name Richard Gavin Reid with provincial politics. During the Great Depression, Don's grandfather (his father's namesake) served as Alberta's sixth premier.

The younger Richard Gavin Reid likewise showed a devotion to service. He and his brothers served in the RCAF in the Second World War, and Dick spent the last few months of the war in a German POW camp. Later in life, in addition to his family and professional obligations, he found time to serve as Chairman of Ryerson University, Chairman of the Mendelssohn Choir, and Chairman of the Red Shield Campaign for Toronto's Salvation Army.

In Memoriam

The Faculty of Engineering sincerely regrets the passing of the following alumni and friends.

Terry Altenhof, Electrical '67, in April 2010
Edward Arnold, Electrical '50, in December 2009
Burnett Bartlett, Civil '50, in April 2010
Robert Brockbank, Civil '51, in April 2010
Hugh Chesney, Mining 1942, in July 2010
Walter Chmilar, Chemical '56, in June 2010
Howard Colwell, Chemical '50, in April 2010
John L. Cooper, Petroleum '55, in June 2010
George Cormack, Professor Emeritus, in April 2010
D. Alexander Cormode, Chemical '62, MSc Chemical '66, in February 2010
Knox Davidson, Chemical '70, in August 2010
Ralph C. Davis, Civil '34, in March 2010
Fay Deuchar, Mechanical '63, in April 2010
Michael Devall, Electrical '81, May 2010
Keith Goodman, Civil '50, in February 2010
T. Jack Hall, Chemical '50, in July 2010
Alexander Hemstock, Mineral Process '43, MSc Civil '47, in August 2010
Theodore Hertel, Petroleum '56, date unknown
Bradley B. Howe, Mechanical '09, in July 2010
Damjan Jocic, Electrical '87, in June 2010
William Landers, Civil '60, MSc Civil '63, date unknown
Walter Long, Civil '58, in May 2010
Arthur Martin, Chemical '50, in July 2010
Hugh A. McColeman, Electrical '36, in April 2010
Gregory Miller, Mechanical '79, in February 2010
Alex G. Morison, Mining '49, in February 2010
David Murray, Professor Emeritus, Civil '52, in July 2010
George Nickoloff, Chemical '49, in February 2010
Narcisse Ouellette, Electrical '95, in June 2010
A. W. Plato, Electrical '60, in May 2010
James Proudfoot, Civil '50, in March 2010
Karel Puffer, Professor Emeritus, Civil '55, in April 2010
Roy Reynolds, Electrical '51, in April 2010
Walter Riva, Mining '49, in May 2010
Jack Stabback, Chemical '49, in June 2010
George Sutherland, Mechanical '69, in March 2010
Gordon Walker, Civil '49, in June 2010
James Wallbridge, Metallurgical '64, in March 2010
Sammy Yung, Electrical '82, in April 2010

The Faculty of Engineering was recently made aware of the passing of the following alumni more than a year ago.

Harry Carswell, Civil '46, in August 2006
John Foong, Electrical '71, in April 2009
Malcolm Innes, Civil '60, in January 1999
H.G. Schmidt-Weinmar, Professor Emeritus, in January 2009
Nenad Tanackovic, MEng '98, in 2007
G. Wilinski, Civil '73, in April 2009

Class gifts honour the honourable

by Bruce White

We form strong bonds with our professors and fellow students; some alumni have found a way to honour those ties through gifts.

Michael Lazar (Computer '84, MSc '88), Peter Faris, Scott Oddie, David Bright and drummer Clayton Dickson (background) perform as the Gradual Stupids at a Halloween party. Lazar's classmates have established the Peer of Peers Award in his memory.

There were four of them—Steven Knudsen, Brent Allen, Michael Lazar and Ron Unrau—all students during the 1980s in the first class of the Computer Engineering program at the University of Alberta. Together they made quite a team.

Each was equally capable of leading or following, Knudsen recalls. The four worked together on class projects, they all had summer research internships, and they graduated as the top four students in the 1984 class.

Later, their paths often crossed in graduate school as three of them went on to earn PhDs. They settled in different cities, but continued to be lifelong friends, attending each other's weddings when they could afford the fare. They even helped each other with startup companies during the technology boom of the 1990s. But their fellowship was sadly diminished in 2001, when Lazar died before his 40th birthday of complications from cancer.

This fall, the surviving three friends and other members of the '84 and '85 graduating classes will honour Lazar's memory, when an award that he inspired is awarded for the first time. The Peer of Peers Award will recognize a student entering the third year of computer engineering for qualities Lazar exemplified—academic excellence, kindness, generosity, a willingness to help others and a wide range of interests.

"Michael always had tremendous enthusiasm for various research topics—the more esoteric the better," recalls Allen. Lazar was always interested in the latest exotic theories related to math or science, but also in many other fields.

"I remember one time we all decided to read a book called *Gödel, Escher, Bach: An Eternal Golden Braid*. That would be an example of the kind of thing that interested Michael," Allen remembers. Gödel was a mathematician and logician, Escher an artist and Bach a musician. This book was three inches thick, and it drew parallels between their three different passions.

A musician himself, Lazar was a bassist in a rock band and played accordion. "Michael was comfortable listening to the New Wave music of the day, but the next minute he'd be listening to Mozart's Requiem," says Allen.

All three also remember being warmly embraced by Lazar's family. "I think it was in our third year that Edmonton had a bus strike that was quite long," Allen recalls. "I had no way to get to my classes as I didn't have a car. Michael invited me to come and live with his family, so that he could drive me to and from classes. They were very welcoming and I felt part of the family."

Knudsen worked with Lazar on student projects that required the group to spend long hours in the lab, trooping over to HUB Mall for ice cream sandwiches after making breakthroughs. They worked on parallel computing, in which two or more processors work in tandem on a

large computation. "We defined a number of interesting problems, such as how to effectively share memory resources between multiple processors, and developing an efficient two-wire data protocol," says Knudsen. "Back then those were interesting problems; I'm not so sure they are now."

For their master's degrees, Lazar and Unrau studied biomedical engineering at the U of A with Zoltan Koles. Lazar and Knudsen earned their PhDs in electrical and computer engineering at the University of Calgary, where Lazar continued to contribute much of himself. He was president of the Graduate Students Association, a member of the Alumni Association Board, a volunteer fundraiser for the Faculty of Graduate Studies and an adjunct professor in the Faculty of Engineering. In 1995 he was awarded the Order of the University of Calgary, and after his death an award was set up in his name to recognize graduate students for service to the university.

Leaving the U of C in the mid-1990s, Lazar worked as a contractor on a communications system for the Canadian army. He also teamed up with Fred Verhagen, a U of A graduate in electrical engineering, to start a company that would become World Web Technologies, which provides software and Internet marketing platforms for the hospitality and tourism industries.

As a group, the four computer engineers spent a lot of time in startup companies, in addition to working on the corporate side. Today, Unrau is a software engineer for EMC^2 in Edmonton. Knudsen has a consultancy in Calgary, TechConficio Inc. Allen works in Ottawa in product management and marketing for SMC, which provides digital components for the automotive and other industries.

"For computer engineers, the '90s were great for startups," says Knudsen. "We had the skills to tackle a number of different kinds of businesses and we did. Ron was with Red Hat Linux for a while, as I recall. I think we all enjoyed the mix of large and small businesses."

In 2009, that original graduating class of 18 students in Computer Engineering celebrated its 25th anniversary. Knudsen, Unrau and his wife Gail Powley (Chemical '84) worked the e-mail to bring as many of the class as possible back to Edmonton for Alumni Weekend.

Allen, Unrau, Knudsen and others in the Computer Engineering classes of '84 and '85 decided they wanted to do something in memory of Lazar—what Allen describes as "honouring Michael by rewarding people who are like him."

Powley and Knudsen worked with Jamie Reid in the Department of Electrical and Computer Engineering, who helped the group frame the terms of reference for the award, set the value, and determine how it is funded.

A minimum of $15,000 is needed to endow an award, and the group had little trouble surpassing that. Many of the class of '84 were already active donors, some quite well off, while others had employers that matched their charitable gifts. The Faculty hopes to make the first award this fall, one year after it was suggested.

The Peer of Peers Awards will be a $500 gift to a third-year Computer Engineering student nominated by his or her peers for criteria including teamwork, creativity and interest in student projects. While modest, the award will make a difference to someone living on a student budget. Its greatest value, more likely, will be on the resume of a young engineer—as an endorsement from fellow students and professors that this is the kind of person other engineers want to work with.

Powley challenges other classes in the university to follow the group's example. "Each class can do this at some time in their lifetime," she says. "And you don't have to wait for 25 years. It can be at 10 years or any special occasion."

Leanne Nickel, manager of external relations for the Faculty of Engineering, adds that in addition to scholarships and bursaries, class gifts can take creative forms.

"A class gift may also support a broader number of students through a student life enhancement fund directed to non-classroom learning initiatives, through the naming of a classroom or laboratory, or simply through a non-restricted gift to their department."

A number of graduating classes have chosen milestone anniversaries to create legacies. One of the most notable is the Civil Engineering class of 1950, which at its 50th anniversary in 2000 raised more than $200,000 to endow the Class of 1950 Civil Engineers' Award—two annual scholarships of $5,000 given to students who show exceptional leadership skills and community involvement. The endowment continues to grow and is approaching $300,000.

Classes often choose to make their gifts in honour of favourite professors, such as the Chemical Engineering Class of 1949's Dr. George W. Govier Award, a $2,000 annual grant that gives priority to students in financial need.

The Civil Engineering Class of 1955 set up awards in memory of professors Leonard Gads on its 30th anniversary, and Jack Longworth on its 40th. On its 50th anniverary, the class set up the Class of 1955 Civil Engineering Golden Anniversary Award. In total, they raised $115,000, with 26 of the original 37 Civil '55 graduates donating to at least one of the three endowments.

Allen, Unrau, Knudsen and others in the Computer Engineering classes of '84 and '85 decided they wanted to do something in memory of Lazar—what Allen describes as "honouring Michael by rewarding people who are like him."

Charlie Grant, one of the organizers of the 1955 class gift, taught construction students for 25 years at NAIT, where one of his duties was distributing scholarships. Now retired for 15 years, he continues to write cheques to support students. Why? "For the extreme pleasure of doing it, and because those of us who can offer that assistance need to do it.

"It's a wonderful experience to help students and see them develop. It's a way of paying back what we got."

Bruce White *is a business writer and editor based in Edmonton.*

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Jaron Van Dijken is working towards his PhD in electrical engineering, specializing in nanosystems and microdevices, applying new discoveries to make solar energy more affordable and effective. The recipient of several prestigious national scholarships, Van Dijken plans on returning to the private sector armed with indispensable new knowledge and skills.

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