

U of A • Engineer

Keeping in Touch with
Alumni

Faculty's Calgary
Connection

Stepping into
Management Roles

International student
to university president

the never-ending student project

How a third-year project shaped
careers and changed lives

Randy Marsden
(Electrical '89)

Message from the Dean

As the second century of engineering education at the University of Alberta begins to unfold, we reflect upon and celebrate the success of Campaign 2008. The incredible support received over the course of this campaign from our alumni, corporate partners, friends, and government entities has allowed us to carefully manage our growth so that we can meet the strong demand for our programs—while continuing to provide the high quality education for which our Faculty of Engineering is known.

The real lesson of this campaign has been that every gift, no matter how large or small, has played a part in the transformation of our Faculty. Over the course of Campaign 2008, we have received over 20,000 gifts from our alumni—on average one for every engineering graduate since 1908. We were able to multiply the collective power of these gifts in discussions with other supportive groups such as government agencies and foundations, which then matched or otherwise augmented the significant cumulative amount. A key example of what can be made possible through this type of amplification of private support is our scholarship program—one of the most comprehensive available to new engineering students in all of North America.

The generosity of our alumni and corporate partners has also helped construct the classrooms, laboratories, and administrative space to facilitate our growth. It is impossible to underestimate the importance of our physical facilities in creating a strong identity and sense of community within the Faculty of Engineering. Over the past nine years, as the walls of our new buildings have gone up, separations between departments and disciplines have come down. The physical interaction between students, faculty and staff has led to collaborations and connections never before imagined.

The success of Campaign 2008 has allowed for an integrated transformation where all areas—teaching, research, and infrastructure—have grown simultaneously, resulting in a whole that is greater than the sum of its parts. The truly outstanding support received from our students, our alumni, our corporate partners, and other friends has shown us that we are on the right course.

On behalf of the students, faculty, and staff of the Faculty of Engineering, I express our heartfelt appreciation for the commitment you—our alumni and friends—have shown and continue to show for one of the premier engineering programs in North America. We would not be the Faculty we are today without your assistance. Thank you!



David T. Lynch, PhD, PEng
Dean of Engineering



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Dean of Engineering
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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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Convocation draws near



Most of us see convocation day once. Most of us listen to one honorary degree recipient's address. In one day we share what is quite likely the biggest day of our lives with family and with classmates. We celebrate our achievements. We celebrate who we have become; we celebrate who we will become. We bid our school and friends good-bye.

For most of us, this day comes but once. Therein lies its beauty. Convocation is a day among days. It is a magical day, like no other.

Those of us who make our living on campus, though, see this ritual like clockwork. It

never loses its mystique, its sense of purpose and tradition.

Convocation reminds us of better days ahead. The potential each of our graduands carries bursts the seams of convocation week. This sense of possibility is a potent force not catalogued in textbooks or labs, but it is expended in every success and every failure (for surely failures offer lessons) that these young men and women have experienced. This sense of possibility is what carries us forward.

Even in these uncertain times our graduates have unlimited possibilities. Before them lie more options than they know. They are equipped to meet the challenges ahead. They possess drive, curiosity and creativity, and a way of thinking, a way of approaching

problems, that will serve them and their communities well.

This is the first full issue of *U of A Engineer* I've had the pleasure of editing. Its pages are filled with stories of potential fulfilled. Our alumni demonstrate their ability to overcome challenges, to innovate, to weather storms, and to follow their passions.

I hope you enjoy this edition as much as our team has enjoyed producing it.

Please send comments, story ideas, and suggestions to richard.cairney@ualberta.ca

A handwritten signature in blue ink that reads "Richard Cairney". The signature is written in a cursive, flowing style.

Richard Cairney
Editor

Letter to the Editor

Dear Richard,

Thank you for sending the 2009 U of A Engineering Calendar and the Fall 2008 issue of the *U of A Engineer*. Great to have them back! You must be on a steep learning curve about the Faculty, taking over from Sherrell Steele, who did a very fine job.

I was an undergraduate student in E.E. at U of A from 1955 to 1959, which then resided in the Old Power House. From 1966 to 1996 I was a member of the academic staff in the Department of Electrical Engineering. I am now enjoying life as Professor Emeritus at the coast in B.C.

If I may, I would like to add an additional brief historical perspective to the article on the ECE Department. First of all, the first head of the EE Dept. was Dr. Hector MacLeod, from 1924 to 1936. He was a true pioneer. He subsequently went on to

UBC to become the first head of EE there, and subsequently Dean.

The two references above are just two of a large number that refer to him. For his pioneering contribution to Electrical Engineering Education in Western Canada, MacLeod was awarded the MacNaughton Gold Medal by the Canadian Region of the Institute of Electrical and Electronics Engineers (IEEE).

Until the Leduc No. 1 oil well blew in after the Second World War, Alberta was a poor province, even defaulting on a maturing bond issue during the Depression. The possibilities open to the university leaders to grow their departments in those days were constrained compared to the plenty that has followed subsequently, so must be viewed in context. For example, the EE Department when I was a student in the late 1950s had one war-

surplus typewriter; it was highly prized, as it had a wide carriage, so that a standard page could be put in sideways as well.

The department had also just successfully completed the challenge of educating a huge post-war undergraduate class in shifts, including Saturday classes. Professor Harle, who was then the department head, finally had some resources to make appointments to expand the field of expertise of the department. Your article rightly did mention the contributions of Professor Porteous in the field of electronics and communications. Professor Ron Philips became vice president of facilities and services, and oversaw the construction of many university buildings. The second initiative of Harle was the appointment of Professor Y.J. Kingma in the area of controls. Subsequently, resources became more readily

available to expand these areas and add others, such as microwaves, etc., as mentioned in the article.

Two illustrious early EE graduates of note are George Sinclair (MSc 1935) and Edward C. Jordan (MSc 1936). Both did research for their graduate degrees under the supervision of MacLeod on the pioneering CKUA transmitter. Sinclair became a leader in the field of electrical engineering in Canada and founded Sinclair Radio Laboratories. Jordan became a leader in electrical engineering education at the University of Illinois, Urbana; he authored many highly regarded books. Both men received many distinguished awards for their professional contributions.

Best wishes,
Paul A. Goud (Electrical '59)
Professor Emeritus



University bolsters Calgary presence

by Richard Cairney

A new street-level office in downtown Calgary is strengthening relationships between the Faculty of Engineering and its alumni and partners in southern Alberta. On January 28 and 29, the University of Alberta officially opened its new U of A Calgary Centre, celebrating relationships old and new. The Faculty of Engineering continues its presence in Calgary with its Co-op Education Program and external relations staff.

“The Faculty of Engineering has recognized the importance of being closely connected to our alumni and corporate partners in southern Alberta by having staff in this area for the past 12 years,” says Dean of Engineering Dr. David Lynch. The new office, he adds, “dramatically improves our ability to interact with our many alumni and partners.”

The Faculty has some 4,000 alumni in Calgary, and it is important that the university recognizes their talents and achievements, and remains connected with them, says Lynch. “Our alumni are among the most eminent community leaders in Calgary, and thousands of our alumni here have done tremendous work to build Alberta. They have helped us transform what we do in the Faculty of Engineering—they’re behind a major transition in the Faculty over the past 15 years.”

Reviews of the Calgary Centre office are glowing. “You walk into the place and right away you feel like—‘Hey, I’m back home again,’” says Neil Camarta (Chemical ’75). “It’s like an embassy. You know you’re at the U of A.” Camarta has always been aware of

the university’s presence in Calgary but says the new office—at street level near the Petroleum Club—bolsters the university’s image. “The U of A has always been in Calgary but now you’ve got this great facility right in the centre of the action, right downtown, and it lives up to U of A standards.”

Dr. Ken Porteous, who oversees the Faculty’s Co-op Education Program, says the Faculty has long felt it necessary to hold offices in Calgary to connect with employers, potential employers, and students who are on co-op placements in the Calgary area. The co-op program provides about 1,400 work terms per year, and it’s important to nurture relationships with partners in industry, and to ensure students are well served. “If students have a question about their program, they’ve got someone right here who can help them,” says Porteous.

Students with the Autonomous Robotic Vehicle Project (ARVP) were also on hand during a January 29 open house, showing off ‘Bearacuda,’ an autonomous robot designed to think for itself and perform tasks underwater. The student group and Bearacuda will take part in an international competition in San Diego this summer.

“You walk into the place and right away you feel like—‘Hey, I’m back home again.’ It’s like an embassy. You know you’re at the U of A.” —Neil Camarta

Dean of Engineering Dr. David Lynch with Heather Lau and Husky Energy President and CEO John Lau at the Calgary Centre opening. At right: Electrical Engineering student Brodi Roberts explains the workings of ‘Bearacuda,’ an underwater robotic vehicle, during the Calgary Centre Open House.

There, Bearacuda will run an underwater obstacle course where it is required to enter an area through a gate, dock with a buoy, follow a pipeline, drop a marker, detect a beacon, and retrieve a payload—all within deadline.

Leslie Reinke (Electrical ’88, MEng ’95) was impressed by the students’ level of work. “For an undergraduate program I think it’s fairly ambitious—it’s not an easy thing at all, and it’s multidisciplinary,” he says. “I’m quite impressed.”

Reinke, who attended the open house and has taught electronics technology at the college level in Atlantic Canada, says the ARVP program gives students an outstanding learning experience. “This is a level of complexity that college students—at a SAIT or NAIT, for example—wouldn’t be doing.”

With nearly 7,000 square feet of space, the Calgary Centre boasts a 48-seat classroom and breakout rooms. Engineering shares the office with the School of Business, the Faculty of Rehabilitation Medicine, the Camrose-based Augustana Campus, and External Relations. The Calgary Centre is located at 120, 333 – 5th Ave. SW, and can be found online at www.calgary.ualberta.ca.

Staying in touch with the Faculty’s Calgary staff is easy. You can contact Acting Assistant Dean, External Relations Laurie Shinkaruk at 403.718.6394 or by e-mail at laurie.shinkaruk@ualberta.ca and Co-op Education Program co-ordinator Linda Lewington can be reached at 403.718.6393 or by e-mail at linda.lewington@ualberta.ca.

Big SHOC

Helping engineers step into management roles

by Judy Monchuk

Rod Gonzales (Chemical '97) has a knack for flourishing in uncharted territory. In 2007, as business manager for Calgary-based Colt Engineering, he helped lay the groundwork for a \$1-billion sale to WorleyParsons, an engineering consulting company. Prior to that, he led global market development for NOVA Chemicals' proprietary plastics technology.

But Gonzales may now be facing his most daunting challenge yet. In October, he became Petro-Canada's director of oil sands business and strategy development.

"It's quite an entertaining time to join an organization," Gonzales wryly observes. In the last six months of 2008, oil plummeted more than \$100 US a barrel: from an all-time high of \$147 US to \$35 US in December. As financial markets collapsed around the world, Alberta energy projects that just months ago seemed unstoppable have been postponed or scaled back.

Yet Gonzales isn't about to push the panic button.

"What makes you a better leader is how you deal with that; leading your people through a precarious time and directing things that may occur," he says calmly. "Understanding your people, recalibrating goals—it's like steering an

ocean liner because it's so complex. How can you refocus the troops? Rally the troops?"

These are sobering times for a generation whose only experience with "dire economic conditions" may be a passing reference to the Depression in a history class. Engineers by definition are problem solvers who build new things and implement new technologies. They always face some sort of test, but this trial doesn't come with a sense of excitement.

More than one-third of engineers will take on a management role at some point in their careers. Not all will grapple with historic challenges such as the 2009 economy or projects with billion-dollar ramifications.

"There seems to be a mindset that you either become focused on a technical path or you are a people leader. My feeling is that as an engineer you have to have both."

— ROD GONZALES

Yet, with dramatic shifts in workplace scenarios and workforce expectations, graduating engineers must have at least a basic understanding of business concepts.

The payoff is an improved ability to understand the workings of an organization.

Gonzales had no management training prior to the advanced programs provided by his employers about five years ago. He says that formal business training has refined his ability to be a more effective leader.

"There seems to be a mindset that you either become focused on a technical path or you are a people leader," says Gonzales. "My feeling is that as an engineer you have to have both."

Peter Flynn couldn't agree more.

Flynn, Poole Chair in Engineering Management for Engineers at the University of Alberta since 1999, pushed to add financial management to the undergraduate curriculum. He also reactivated the U of A's graduate program in engineering manage-

DES

Rod Gonzales
(Chemical '97)
has taken his
management
skills beyond
the boardroom.



ment, which had been scaled back during the Alberta government's funding cuts in the 1990s.

Flynn was adamant his students wouldn't face the frustrations he experienced as a young chemical engineer. "I learned management by the seat of my pants," he says. "I was asked to run a company and I couldn't read its balance sheet."

Once he grasped management basics, Flynn oversaw high-powered projects including the \$200-million revamp of Shell Canada's Scotford refinery to process upgraded bitumen. By passing on lessons learned from those experiences and entrepreneurial tips, he helps give graduates a competitive edge.

"I had a gratifying experience where one former student said that, because of my class, he felt capable of setting up his own enterprise when the bottom fell out of the dot-com boom," says Flynn.

That extra dose of confidence can be invaluable—especially in a tough economic market. Today, many engineers seek management training at both the undergrad and graduate level. Traditionally, engineers would spend several years working in their chosen field and fine-tune their skills before deciding to examine the management path. At that point, many would begin to pursue MBA

"At the graduate level we are the pre-eminent engineering management school in Canada and among the top 10 in North America."

— PETER FLYNN

programs. But the Faculty of Engineering is looking to set itself apart with its master's degree in Engineering Management.

"My definition of engineering is the commercial application of science, where 'commercial' means creating value," says Flynn. "We give them a much better set of skills."

The popularity of engineering economics prompted the department to add a course in adapting technology to meet social needs, and another focused on engineering and the environment.

Gonzales believes adding elements of management training to the basic engineering degree will help new graduates fit into their profession and rise through the ranks faster.

"I think the U of A is being very, very astute in understanding the needs of industry," says Gonzales. "Needs changed in the last 10 years."

For one thing, today's engineering students

have different expectations. Few expect to stay with a company for 20 years, as their parents might have done. Instead, they want the tools and skills to carry them along career paths far more self-directed than those of past generations. Students view their university educations in a more transactional manner, assessing each course on whether it delivers value.

"The needs of students have changed," says Gonzales. "As soon as they can get a handle on what management and an organization is about, they will be able to insert themselves into a company."

Mark Hlady is part of a new generation looking to revamp and expand the engineering profession. He sees management training as a key component in that transformation, and likes the different perspective that came with an engineering management course.

"It was more business-focused," says Hlady, a 20-year-old Saskatoon native in his third year of materials engineering at the U of A. Hlady doesn't like the term "real-world" experience, although the course is aimed at just that: giving students more insight into how their work can affect a corporation's financial bottom line. Those who learn to understand potential consequences—that engineering decisions can cost a company millions of dollars, or that a billion-dollar infrastructure project may be shelved based on a financial analysis—become more valuable to employers.

"It's the details that allow you to make the financial decision that determines whether a project goes ahead or not," says Hlady. "I appreciate the real examples, because it shows the importance of other classes we're taking, like math or science."

Banker-turned-angel-investor Amit Monga (PhD Mechanical, '96) agrees wholeheartedly. After Monga earned his PhD, his first managing consulting project was a detailed analysis for Canadian Airlines. In a presentation to CEO Kevin Jenkins, he identified significant inventory cost savings if the Calgary-based carrier were to be acquired by Air Canada.

Monga felt the mood in the room change as he presented his conclusions. "I could see how my little analysis was being translated into shareholder value, that 'if this inventory can be managed better, this can impact on

Dr. Peter Flynn, with students Dominique Leger and Mark Hlady. Flynn says the Faculty of Engineering is positioned among the top 10 in North America in terms of teaching engineering management.



shareholder value,” he says. Suddenly, Monga realized that sophisticated problem-solving skills could be utilized in business. “It was a career moment. That’s when I thought ‘Wow.’” Monga began training himself to think from a shareholder or big-picture perspective.

“There will be a time in every engineer’s career where someone will say, ‘Your analysis really helps us and gives us a range of options on how we will be going forward,’” says Monga, founder of Toronto-based Nytric Business Partners, an international venture advisory firm. Monga wants to pass along that insight.

Today, Monga writes an investment column in the *National Post*. An executive professor of finance at the U of A’s School of Business, Monga helped launch the MBA in finance specialization and taught corporate finance to U of A engineers for two years while working on his PhD. He believes those introductory business courses are enough for young graduates.

“The focus should still be engineering,” he says. “I think we need to bring industry leaders into the classroom to inspire students. It would be nice to get perspectives from engineers who have done well.”

“We need to bring people aged 35 to 40 into the classroom, including alumni who have moved beyond their training to non-engineering management,” says Monga. “We need more mentors—people who are willing to come back on campus, willing to talk about what they’ve done and make that connection early on in their careers.”

Hlady views management training as vitally important to his future prospects. It helps him to better assess organizations as he gauges employment opportunities and considers setting up his own company. It means options.

“We’re designing the technologies that are going to change the world,” Hlady says. “We have to know how to manage these projects.”

Electrical engineering student Dominique Leger says an engineering management course on financial management changed her outlook on the future. “It was necessary base knowledge,” says Leger, who holds the U of A Women in Engineering Chair for IEEE (Institute of Electrical and Electronics Engineers), a professional association that

advocates advancing technology. “Everyone should know these things if they plan to be successful financially.”

Being able to read a balance sheet and spot its ramifications beyond a particular project is a useful skill for anyone—whether or not they end up in management. Says Leger, “It makes me more valuable as a potential employee.”

Engineering graduate student Mohammed Ali came to Canada in 2006 from his native Pakistan, where he had earned a master’s degree in electrical engineering. He soon began working at Magna IV Engineering in Edmonton, where his duties involve conveyor systems and the automation of bulk material handling. It’s similar to the work he was doing in Pakistan. Ali quickly realized his education wasn’t enough if he wanted opportunities in his new country.

“Three or four years ago I was not aware that engineers had to be good managers at some part of their career,” says Ali. “I was not exposed to that back home. There, I was doing technical stuff, not management. Here, I think management training is a must. At some point, you have to know how to manage the work and the people involved.”

The transition is not always smooth. Engineers find solutions to problems using technical skills that don’t always translate well into managing staff. Ali has become acutely aware of that struggle as he pursues his Master of Engineering in Engineering Management degree at the U of A. Since the fall of 2007, he has been combining his work schedule with a graduate program focused on project management.

Understanding management procedures also creates opportunities to champion causes, says Hlady, who serves as commissioner of social issues for the Canadian Federation of Engineering Students. The federation wants to attract a more diverse group of people to engineering. Through a project dubbed “social engineering,” it aims to show high school students they can pursue ideals in a discipline more associated with blending scientific and technical knowledge.

“Management training empowers us to make more holistic decisions,” says Hlady, conceding his statement seems at odds with the traditional view of engineers. “Most people decide in high school to go into engineering,



Amit Monga’s management skills have extended into a monthly column with the *National Post*, and a supporting role in the Toronto International Film Festival.

“I could see how my little analysis was being translated into shareholder value, that ‘if this inventory can be managed better, this can impact on shareholder value.’ It was a career moment. That’s when I thought ‘Wow.’”

– AMIT MONGA

If they’re good at math and science and want to make money, it’s the way to go.”

Yet, Hlady argues that more starry-eyed optimists who want to reshape the world should also consider the profession.

“It might be more appropriate to go through engineering rather than take their political studies course,” he says. “People don’t understand the breadth of engineering work out there. They think we build cars, build roads. And we do.” But it’s important to know that engineers can impact a broader range of issues, including social problems. Hlady maintains it will be engineers, not politicians, who will devise solutions to food shortages and environmental crises facing the planet.

“If more people went into engineering aiming to solve particular problems they felt were important, there could be clean water around the world,” he says. “If we were as efficient at capturing water as we were getting oil out of the ground, thousands

of people wouldn't be dying of water-borne diseases."

Indeed, engineers are taking on community leadership roles in areas far removed from their jobs. And the management skills they apply in their professional lives also enrich the greater community.

Gonzales, the oil sands strategist, is a self-described over-achiever. The first of three Canadian sons born to Filipino teachers who immigrated to provide their children with opportunity, Gonzales grew up in the northern town of Hay River, N.W.T. He thrived with each challenge placed in front of him, whether it was holding high school executive positions, competing on the national stage as a figure skater, or becoming a classical pianist. But it was Larry Benke (Electrical '73) at Colt Engineering who told a young Gonzales that it was important as a business leader to show leadership in community causes. Gonzales is now on the board of the Honens International Piano Competition in Calgary, where young pianists from around the world compete for cash prizes and a lucrative career development program. He's involved with the United Way. And each week, he leads the music ministry at St. Luke's Catholic Church.

"Through these networks, I started to meet amazing people who were involved in philanthropy, people in oil and gas," says Gonzales. "All of these people have enriched the greater community, and within a week, new opportunities to contribute to the community came my way."

Monga, who is Indo-Canadian, is a key figure in bringing Bollywood films to Toronto. He views his volunteer work with the Toronto International Film Festival as a way to raise cultural awareness. That connection was forged when festival organizers sought out more Main Street and Bay Street partners; instead of targeting major corporations for large sponsorships, the festival focused on more donations from people making \$500,000 to \$1 million a year.

Monga committed to hosting 25 fundraisers for the festival. That's allowed him to rub shoulders with movie stars Brad Pitt and Angelina Jolie. But he says the greatest thrill was being able to take his boys, now 6 and 8, to the world premiere of *Terra*, an animated family film with a message of peace and envi-

ronmental concern. He hopes the film festival will become an established launch pad for movie funding deals.

"My focus is social issues," he says. "If there's a way to portray that through film, great."

As investors seek more opportunities with philanthropic goals, Monga sees much closer working relationships developing between engineers and businesspeople. "Can you make money-making devices that can make safer water? Absolutely."

In the coming months, Monga will be pitching the idea of business students taking engineering courses and vice versa, aiming for a cross-pollination of perspectives and ideas. And despite his own experience with generalized business courses, Gonzales feels that specialized management training with an engineering focus would be beneficial.

"The world involves dealing with many different functioning groups," he says. "There are subtle nuances: there is managing with other leaders in an organization, then there's managing the engineers. General training provides more fundamental training of leading an organization, but to customize things that are specific to the engineering profession would be great."

But you can't learn everything in a classroom.

"Can you teach people entrepreneurship? I don't think so," says Monga, who left investment banking in June, 2008. "But having that option available to engineers, I think it's good. I wish it had been available to me."

He still believes that students can be best taught through the words of engineers who are in business and putting their training into action. Despite the push towards more management training, that alone can't guarantee success in the boardroom or a larger bank balance.

Peter Flynn acknowledges that management skills can't always be taught. "Management is a bit of an art. You can

"I think management training is a must.

At some point, you have to know how to manage the work and the people involved."

— MOHAMMED ALI

learn to be a better painter, but no training can make you a Monet."

Still, the Faculty's strength in engineering management can be traced to the real-world experience of its staff and other professionals who teach in the program.

Joel Nodelman draws on 15 years of work in climate change initiatives when he teaches undergrads sustainable development and engineering economics. Touray Nasserri, who teaches a graduate course in knowledge and innovative management, has extensive experience with industry, government, and research. Suresh Jaisingh, a PhD in industrial engineering, puts his lean manufacturing expertise into practice at Canada Post.

The growth of the engineering management program indicates the thirst for engineering management training. In 1999, the program had four students. In 2008–2009, it had grown to between 80 and 100 students, eight full-time professors and four adjunct instructors. While some choose to pursue research, the majority are working engineers seeking to expand their knowledge and prospects.

"At the graduate level we are the pre-eminent engineering management school in Canada and among the top 10 in North America," says Flynn, noting the quota program has been turning away applicants for years.

"There's certainly more of a technical flavour in our type of management than you might find elsewhere."

Gonzales says few people see the wide possibilities management training can offer beyond business. Many don't realize that once engineers move into leadership roles, their influence can move far beyond the boardroom. Corporate leaders who get involved with community programs have the opportunity to connect with the public and their staff in a whole different way, especially if it is a cause close to the employee's heart.

"It makes them see this person as multi-dimensional," says Gonzales. "It's another way they can be further inspired by that leader."



Calgary freelance writer Judy Monchuk covered the 21st century oil patch boom, its impact on business and Albertans outside the energy industry.

Drs. Anastasia Elias, Amos Ben-Zvi and Ania Ulrich discovered a passion for teaching while serving as Discover E camp instructors.



Discover E discoveries

*Former engineering camp
instructors take teaching
to highest level*

by Julia Necheff

A ritual takes place at the University of Alberta every Monday morning during July and August. A cadre of enthusiastic students waits with anticipation as parents arrive on campus and drop off scores of children for Discover E camp. For the next five days, the students become teachers, engaging their young charges with fun and interesting activities designed to bring out the children's inner scientists.

And so it has gone for the past 16 years. Since 1993 the Faculty of Engineering's student-initiated and student-run Discover E program has reached out to children and youth to raise their awareness of and interest in engineering, science, and technology. Discover E instructors offer classroom science workshops in elementary and junior high schools during May and June, and run camps during the summer. The program enjoys strong support from the Faculty, industry sponsors, schools, and the communities it serves.

Discover E has grown tremendously since 1993, when a handful of U of A students organized hands-on activities they hoped would make engineering and science fun and interesting for a couple of hundred

Edmonton children. Since then, it's estimated the program has reached more than 125,000 children and youth.

In 2008, nearly 18,000 children in Alberta and the Northwest Territories participated in Discover E activities. A staff of nearly 40 students ran 633 school workshops in 31 communities and 85 week-long camps in 14 communities. Most camps are still held at the U of A campus in Edmonton, but Discover E holds others as far away as Tuktoyaktuk and Inuvik in the Arctic. Last year there were 22 workshop topics, each designed to complement a science unit in the provincial school curriculum. Camps were offered on popular topics such as animal science, forensics, Lego robotics, and 3-D game design.

Year after year, positive testimonials from parents and campers show that Discover E is interesting and enjoyable for many young people. One camper sums up his summer experience by saying, "I learned you can do as much on the computer as you can think of." Another learned that "actual CSI on TV is not the same as in real life. And you have to get all the evidence first. Then you get your suspect."

Discover E doesn't have an impact on just the children. The engineering students who

become their role models and mentors also carry away special memories. "One of the six-year-olds told me that she wanted camp to last for 93 days and that she wanted us to come back and be her science teachers," one pleased instructor reports.

Three U of A engineering alumni who are new members of the Faculty each spent one summer as Discover E instructors while they were undergrads. As the professors look back on these earlier experiences, it becomes apparent that successfully educating university students is a little like keeping a bunch of elementary school kids entertained.

**DR. ANIA ULRICH, Assistant Professor
Department of Civil and Environmental
Engineering**

Discover E was a fledgling initiative when Ania Ulrich (Chemical '99) saw an "instructors wanted" poster in one of the engineering buildings, back in 1994. "I needed a summer job. I had been a Parks and Recreation playground coordinator before and thought this would be fun," Ulrich recalls. "I hadn't heard much about Discover E; it was new then. There were only five instructors running the whole program."

Those five had to develop their own presentations for the school visits, so Ulrich and her fellow instructors set out to create some experiments that would not only demonstrate scientific principles but would also entertain school children. The instructors incorporated the “glowing pickle trick”—which has become a program classic—into the Discover E repertoire. “You take a pickle and stick a fork

New girls’ club, car races, on 2009 DE schedule

Since that first all-girls Discover E camp in 1999, female enrolment in the Discover E camps has grown to 35 percent, well on its way to reaching its goal of 40 percent. Discover E has also made an effort to target other populations under-represented in the field of engineering—aboriginal and inner-city children and youth—and to reach kids in remote communities.

2008 was a period of expansion for Discover E. It increased the number of communities it serves from 20 to 31, and expanded its bursary program for families in financial need. This year, program organizers hope to launch an urban aboriginal bursary program.

Discover E now has a full-time director, Shelagh Pyper, and has become a year-round initiative. In January, it launched a new club called Girls, Engineering and Mentorship (GEM) for girls Grades 3 to 8. Participants met for four hours every Saturday for eight weeks, learning about engineering and technology. Thirteen female undergrad student volunteers—all studying Engineering—served as role models and mentors to their young counterparts. Toward the end of the program older girls became mentors themselves, hosting Girl Guides who visited the Faculty.

In partnership with Edmonton Public Schools and the Edmonton Catholic School District, Discover E hosted the first annual CO₂-powered car races in March. The competition complemented the CO₂ car-building project in junior high school Career and Technology Studies classes.

“Looking back over the past 16 years, the growth and success of the Discover E program is astounding,” Pyper says. “This tradition of excellence, innovation and the desire to achieve bigger and better things can be directly attributed to the committed and hard-working staff, the Faculty of Engineering and the generosity of our loyal funders.”

For more information on Discover E visit <http://discovere.ualberta.ca/>.

in it and then run a current through it,” Ulrich explains. “The voltage ionizes the sodium in the pickle to create a yellow glow—the same principle behind street lamps.”

Ulrich, a chemical engineer, can take credit for the “exploding toilet” experiment. “I created a water trap with a miniature guy sitting on top of it. We would mix baking soda and vinegar and it would explode, and the guy would go flying off the toilet. The kids loved our presentations. And if they didn’t, it wasn’t hard to tell. Kids are so honest.”

Ulrich and the other instructors were also entirely responsible for all aspects of the week-long day camps they ran. “I have to say, when I look back, I’m so glad I did it,” she says. “A camp may not look as impressive on a resume, but it provided so many valuable skills. The interactions helped develop interpersonal skills; having to stand in front of a crowd boosted the confidence level; the preparations and co-ordination taught us management skills.”

Ulrich’s Discover E experience solidified her decision, by her second or third year of engineering, to become a professor. She especially remembers the connection she felt with the students from Grades 4 to 6 during the school workshops. “Even though they were so young, they were soaking it up. It has affected my view of education at the university level and how important it is to engage students.”

At the Discover E camps, the student instructors designed free-form projects for the kids. “Grad school is also very much like that,” Ulrich says, noting that, whereas undergraduate engineering education is very structured, grad school is very creative.

Sometimes things didn’t go as planned. Ulrich remembers one project in which the campers were supposed to grow crystals. “The kids all did it, but it didn’t turn out. They were pretty good about it,” Ulrich recalls. The experience taught her another valuable lesson about teaching, she says. “You need to be honest with students. You have to let them know that you’re learning together. They (the university students) respect me more when I can admit I don’t know something or that I’ve made a mistake.”

Ulrich is in her first year of teaching environmental engineering students. It would

appear her decision to be an educator at the highest level was the right one. “I’m very energized by teaching. I really enjoy interacting with my undergraduate and my graduate students.”

She’s also looking forward to the day when her two young sons are old enough to go to Discover E camp.

DR. AMOS BEN-ZVI, Assistant Professor Department of Chemical and Materials Engineering

Amos Ben-Zvi (Chemical ’99) was a Discover E instructor in 1995. “We were on a shoestring budget,” he says, so the team had to scavenge materials for the various activities it was planning for campers.

“I’d go around campus getting junk—I’d find cardboard, or I would lug back these big sheets of plywood. I found some Styrofoam. I remember sitting there, cutting Styrofoam into shapes. I had to be very independent. I learned from that experience that I was pretty resourceful.”

Like Ulrich, Ben-Zvi has fond memories of both the school visits and the camps. “It was a fun job,” he says. For their school science shows, the instructors did the glowing pickle number as an electricity demonstration. “For kids, that’s kind of cool.” Or the Discover E team would have an oscilloscope and demonstrate how sounds can be visualized as shapes. “I’d go to a school, and by the end of the day I was friends with all the kids. I think Discover E reinforced for me that I was the kind of person who could enjoy teaching.”

During camp, the days would go by quickly. Ben-Zvi says instructors purposely designed activities so the children could learn by exploring and learn from their mistakes. “We’d give them a bunch of stuff and say, ‘See what you can do with this.’ I think the lack of structure was good for the kids.”

In one memorable activity, the campers fired eggs from a homemade cannon made by one of the other counsellors, Patrick Zdunich (Mechanical ’99). A parachute was attached to the egg. The goal was to land the egg safely. One of Ben-Zvi’s most gratifying memories was when, after failing time and again to prevent the egg from breaking, a group of campers finally achieved sweet success. “One of the kids really got into it. He and the other kids were trying to figure out how to get it to work. Finally he fired one, the

parachute opened and everyone was quiet as the egg slowly descended. When it landed without breaking, the kids all broke out cheering. It had been such a collaborative effort.”

It was a challenge for Ben-Zvi to learn how to deal with children who didn't want to be at camp. He says he didn't adjust very easily to those kids who needed a different approach. In hindsight he realizes patience and understanding are key in such situations. “Kids need time,” he says. “They're not like adults.”

Nowadays, Ben-Zvi, 31, who was trained as a chemical engineer, teaches fourth-year and graduate-level courses in process control and statistics. He has been teaching for three years. Some of the lessons he learned as a Discover E instructor have carried over to the present. “I learned that for people to remember things, they have to have an emotional response to it. If you can show them something in a way that's creative and they say, ‘That's neat,’ they remember it. That's an emotional response.”

**DR. ANASTASIA ELIAS, Assistant Professor
Department of Chemical and Materials
Engineering**

By the time Anastasia Elias (Engineering Physics '02; PhD Electrical & Computer '07) became involved with Discover E during the summer of 1999, the program had about a dozen instructors and nearly 1,000 campers. It had expanded beyond Edmonton; the organizers were taking their science shows to classrooms in Fort McMurray, Red Deer and Grande Prairie. Some computer instruction had been added to the topics covered.

As an assistant director, Elias was one of the program administrators but also had the opportunity to present workshops to students in Red Deer and Fort McMurray. As always, the instructors came up with fun activities and explained the science behind them while letting the young students be hands-on and creative. “We made lava

At one of the camps, students did a lesson on geometry using origami. The kids folded origami pieces and then fit them together to make six points, 12 points, and so on. One of the girls went home and folded all night, and came back the next morning with a huge structure. For another activity, the instructors organized a talent show for the campers. “A

“A camp may not look as impressive on a resume, but it provided so many valuable skills. The interactions helped develop interpersonal skills; having to stand in front of a crowd boosted the confidence level; the preparations and co-ordination taught us management skills.”

— ANIA ULRICH

lamps and the kids just loved it. We also got them to design web pages and helped them set up e-mail addresses.”

Elias's group moved the Discover E program a significant step forward when it came up with the notion of setting up a camp for girls only. “When I was in first-year engineering, only 22 percent of the students were female. I never understood why that was. I thought it would be great to expose more girls to engineering. The idea was that, like our other camps, we'd show them the university and have them become more familiar with engineering and science, and hopefully get them interested in the field. The dean's office was very supportive of the idea.”

girl solved a Rubik's cube as her talent. That was cool.”

Elias, 29, also grew in many ways. “I really did have to learn how to manage a class. I also learned you can't control everything, you have to adapt.” And Elias acquired strategies to make her pupils participate in their learning. With the focus at the university level being on active learning, this will be a valuable skill for Elias as she progresses in her professorial career.

Like Ulrich and Ben-Zvi, as she looks back Elias is struck by how much responsibility was placed on them. “The Faculty put a lot of trust in us,” she says. Elias hired other Discover E staff, booked class visits, and advertised the program to teachers. Those organizational skills are coming in handy now that she runs a lab and supervises undergraduate students.

Elias, who trained as an electrical engineer (on the materials side), says one of the most rewarding aspects of investing time with Discover E that summer was the feeling of community with her fellow staff members. “We were ambassadors for engineering, and that made you think of what it meant to be an engineer.

“Now it's great to be part of the Faculty.”



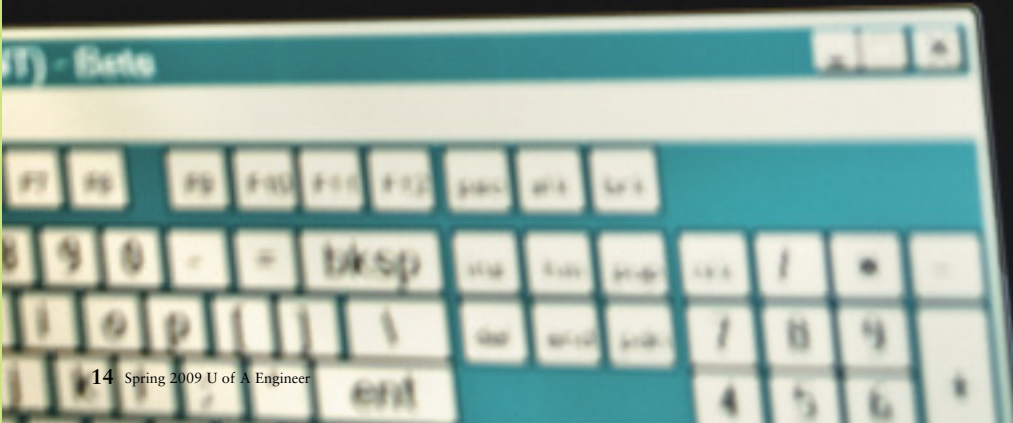
Julia Necheff spent nearly two decades with The Canadian Press news agency before becoming a freelance writer/editor.



Discover E instructors, including Dr. Anastasia Elias, bottom right, and participants at the 1999 overnight camp.



Madentec founder and President Randy Marsden (Electrical '89) embarked on a career that would change lives before he even graduated.



How a third-year project shaped careers and changed lives

by Mike Sadava

the never-ending student project

A busted boom box—part of a third-year electrical engineering project aimed at helping a quadriplegic friend communicate—inadvertently launched two careers and a very successful business, and ended up playing an important role in advancing technology that has unlocked doors for disabled people around the world.

Randy Marsden (Electrical '89) is president and CEO of Madentec, a company that specializes in assistive technology to help disabled people communicate using adapted computers.

While the company is located in humble digs in a nondescript industrial strip mall on the south side of Edmonton, its products

are used around the world. One of Madentec's innovations, an on-screen keyboard, is included in every PC running Microsoft Windows. Madentec's technology has been used by celebrities such as Christopher Reeve and Muhammad Ali, and by thousands of disabled people worldwide. The company's spinoffs are also developing widespread applications for cellphones and computers.

It all started with a student project in 1987. This was the Jurassic period for personal computing. Macs were new, Windows had just been invented, and the Internet was still limited to a small circle of academics and military people.

Marsden and his lab partner, Michael Tanne (Electrical '88), faced two choices for

their third-year project: to design a system to push a button and generate a random number or to spin a wheel and count the number of times it goes around. Fortunately they were also given a third option of designing something that was their own idea.

Marsden had a friend, Si Peterson, who had been a quadriplegic since a gymnastics accident in junior high. Si couldn't move his head or hands, and he couldn't speak because he was ventilated. He could communicate only by mouthing words and gesturing with his eyebrows.

Peterson's parents asked if the electrical engineering students could design a power wheelchair for the young man. Marsden and Tanne suggested approaching mechanical

engineers for that task, but offered instead to create a speech synthesizer.

The challenge was to build a small computer that would enable their friend to at least communicate basic needs such as hunger and thirst.

It took much more time than the average class project, but Marsden and Tanne came up with a gizmo, mounted on a microphone stand, that enabled Peterson to communicate 25 different commands by touching switches with his lips. The pre-recorded digital sound, a new technology at the time, was played through a boom box.

“It was pretty rudimentary, but we basically built a laptop computer before they existed,” says Marsden. Their supervisor, Professor Nelson Durdle, could see his students were on the cusp of some serious innovation, and he even wrangled them some space in a graduate lab—a rare privilege for undergrads.



Photos courtesy Randy Marsden

Si Peterson (top) benefitted enormously from technology developed by Michael Tanne and Randy Marsden. Peterson wrote an autobiography, gave public speeches, and gained enough independence to move back home for the last three years of his life after years in a nursing home.

“It was pretty rudimentary, but we basically built a laptop computer before they existed.”

— Randy Marsden

With the bugs worked out of their project, Marsden and Tanne entered the Canadian Engineering Competition, the first of several competitions they would go on to win. When they arrived in Vancouver, the two suffered the fateful mishap that would reshape their destinies. On a sidewalk ramp outside the Vancouver International Airport, the two young engineering students were behaving like, well, like young engineering students.

“I rode the luggage rack down the ramp, and of course it crashed,” says Marsden. When the boys surveyed the damage, they were horrified to discover that the boom box, a vital component in their presentation, was broken. They got to a UBC engineering lab for a quick repair. Then, as they walked through a dim corridor in the engineering building, they glimpsed a poster inviting student presenters to apply for a conference of the Rehabilitative Engineering Society of North America. They jotted down the contact information.

To make a long story short, they applied, were accepted, and ended up showing off the fruits of their labour in Montreal, in front of many of the major players in assistive technology. Before attending that conference, neither Marsden nor Tanne had known that they had been dabbling in an emerging field of engineering, and that they could make a career in assistive technology. After their presentation, the job offers began pouring in, even though the pair still had a year to go before receiving their degrees. The flood of interest sparked a new notion in them. “I thought that, if what we’d done was so great that people wanted to hire us, maybe we should just do it ourselves,” recalls Marsden.

Tanne remembers the day he fully committed himself to the project. “We both had job offers through the engineering recruitment office—I had one from IBM and Randy had an offer from NovaTel,” he says. “I was in the IBM lobby in North York where I was given the job offer, and they were giving me a

tour of the place, and I got on the phone with Randy to say, ‘Are we really going to do this thing? Because if we are, I’m going to tell IBM to forget it.’

“It kind of dominoed and created my whole career, really.”

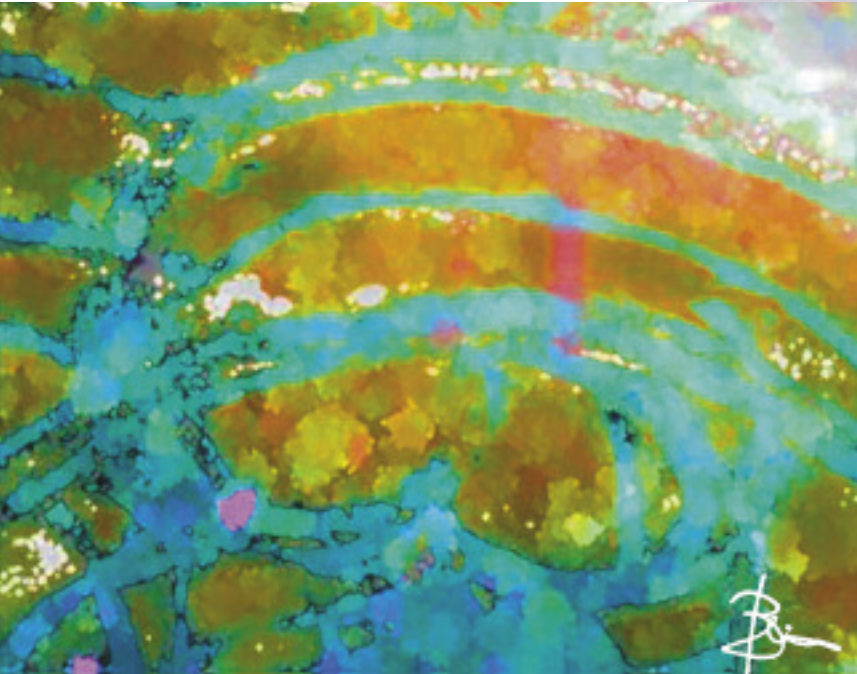
Tanne politely turned down the IBM job and flew home. Madentec soon started to take off. The company received grants from the Alberta Heritage Foundation for Medical Research and the Alberta Opportunity Company and started partnering with Sym Systems in San Jose, California, developing voice synthesis software. While Marsden completed his degree, Tanne packed up and moved south, and continued working with Madentec. A year later, however, he amicably parted ways with Marsden to work for Sym full-time.

Tanne, who now lives near Palo Alto, California, is still amazed at what he and Marsden did with a third-year project, and at the impact it had. “It’s a lesson in life—you walk a journey and you never know where it will lead,” he says. Much groundbreaking innovation has started from university projects, Tanne says, pointing out that Google was originally a campus project at Stanford University. An assignment like his 1987 student project “gives engineers a chance to solve a real-world problem—to solve something that a business person would. It forces you to look at it not just in an academic way or an engineering way, but what problems does it solve and what are the constraints?”

Like Marsden, Tanne had a knack for business. He temporarily left the high-tech industry to earn an MBA at Stanford. Next, he joined the Enterprise Corps, a business version of the Peace Corps, to help former communist countries develop a business framework. Tanne has since built a thriving career in the dot-com world, starting, developing and then selling companies. In 1996 he started Ad Force, the first Internet advertising company, which he later sold to CMGI. Then it was XDegrees, a data storage company, which he eventually sold to Microsoft. More recently he started wink.com, the world’s biggest Internet people finder and one of the top 100 visited sites on the Internet. Wink was recently merged with Reunion.com.

Meanwhile, Marsden and Madentec made their own mark. As personal computers became more sophisticated, so did the compa-

Edmonton artist Bill Miller, stricken with multiple sclerosis, used GPS and video game technology to participate in a golf competition staged by Marsden's company, Madentec.



Bill Miller

Artist Bill Miller longed to use his power wheelchair as a paint brush. One morning as he and his wife Evelyn were leaving the house, Miller looked at his driveway, covered in snow. "What I saw before me was a 15 x 80-foot unbelievably white, virgin canvas," he says. "My wheelchair was a new mid-wheel drive Quickie 424 that allowed me to turn a complete circle like I was on a turntable. Therefore I was able to turn complete circles without going over my tracks. As a result I ended up with a series of connecting circular patterns that were impossible for me to create any other way."

That morning's work was the inspiration for *The Chairbrush Project I* and *The Chairbrush Project II*, a series of works based on images Miller created by wheeling through snow, and documented in photos taken by Evelyn. Miller uses computers to artistically build on the images.

Miller has lost the use of his hands and without technology provided by Madentec, the artist's creative voice would be silenced.

At left: *In the Eye of the Dragon*, by Bill Miller.

ny's innovations. By 1991 Madentec had developed the on-screen keyboard, which was licensed by Microsoft. The life of Marsden's friend Si, the impetus and first benefactor of his ideas, became more complete and productive. With the help of the technology, Si wrote a book about his life and gave public speeches. He was also able to move back home for the last three years of his life after years in a nursing home. Unfortunately, Si died of pneumonia in the mid-1990s.

Currently, Madentec's technology is used by about 20,000 individuals—including Seattle-based Steve Harper, a man with cerebral palsy who maintains Madentec's company website. When he was 11, Harper learned Morse code. He used it to communicate by banging head switches, and was fortunate to have been given a Morse code communicator. In the '90s, a company in the United States developed software called Ke:nx that allowed users of Morse code to operate a computer. Ke:nx changed Harper's life, but when the new generation of Macs—running OS X—came out, the software was no longer compatible.

"So I found out that Madentec bought the old Ke:nx technology," Harper says by e-mail. "I e-mailed Randy in 2004 and told him all about myself and I told him that I needed an updated Morse code system that would work on the Mac OS X. Quickly Randy and his brother found out how persistent I am. I wasn't rude but I kept on e-mailing and e-mailing them."

A mutual friend ("with Randy's blessing") made a Morse code system for the Mac OS X. This year, Madentec is coming out with a commercial version of the Morse code for the Mac OS X, with more features. Harper finally met Marsden face-to-face in April 2007, when "really right out of the blue," Marsden invited him to go on a cruise to Mexico with Madentec. During the cruise, Harper made a presentation on the great potential Morse code has for Madentec. A couple of months later, Harper e-mailed Marsden, asking him if he wanted help on the company website. He landed a job as Madentec's webmaster.

"I love the job," Harper says. "With America's economy basically down the toilet,

a lot of 'able-bodied' people are unfortunately unemployed. However, I'm employed. When I think about that, I just laugh in amazement."

Marsden talks a lot about how Madentec's technology "just gives people their lives back." Bill Miller is another example. Miller, an Edmonton visual artist and former industrial arts teacher, suffers from multiple sclerosis. As the disease progressed he lost use of his right hand, then his left. "When I met Randy in 1995, I was at a point in my life where as an artist I was left expressionless because at the time I had lost the use of both hands," he says. Within a week of being outfitted with equipment that allows him to manipulate a cursor through head movements, Miller was back creating art on the computer. He now does it four or five hours per day. He has become part of an on-line network of like-minded colleagues and has delivered PowerPoint presentations at conferences.

In 2000, Marsden thrilled Miller by inviting him to play in a special golf tournament at the famed Pelican Hill golf course in



Marsden with boxing great Muhammad Ali, whose ability to communicate is seriously compromised due to Parkinson's disease. New technology, Marsden says, allows "extraordinary people to do ordinary things."

Newport Beach, California. Each foursome had one quadriplegic golfer who used a computer simulation and assistive technology to make shots, and the best shot of each foursome of every hole was counted. Miller, an avid golfer before MS set in, made the best drives of his group. Golf carts were equipped with a GPS, and the ball would be placed where he "drove" it on the computer. The event received coverage from all the major American television networks.

Much of Madentec's activity is built around its TrackerPro technology. A camera mounted on a computer tracks the movement of a small dot of reflective tape worn on the user's forehead, glasses, or hat brim. The user can then use head motions to do anything a computer mouse can do, or to perform word processing with the help of an on-screen keyboard. Other Madentec options allow users to operate computers with blinks, tooth clicks, puffs, or touching with lips. It may seem like a laborious process, but with practice people become adept at using these technologies, says Marsden. "It's slower than when you or I use a mouse, but they get surprisingly fast. If you were like my friend Si, you've got the time.

"I get upset when people say we've given them a gift. We say we enable extraordinary people to do ordinary things. Just about in any case, anything made for people with disabilities ends up helping everybody." Marsden cites the example of on-screen keyboarding, which has become a feature of devices such as iPhones.

"I get upset when people say we've given them a gift. We say we enable extraordinary people to do ordinary things."

— Randy Marsden

Madentec's achievements have made Marsden a key figure in the field of assistive technology. Kelly Fonner, a special education teacher who trains teachers and therapists throughout the U.S. in the use of assistive technology, has known Marsden and the products of Madentec since the early '90s. She says he is a leader in the trade association to which dozens of companies belong. Fonner says that many assistive technology companies, like Madentec, got started because someone knew a disabled person who needed help. The innovations created by these companies have not only changed lives; they have changed society as a whole. By expanding the ability of disabled people to communicate, they have shattered the misconception that people who cannot speak have nothing useful to say. This in turn has allowed more people to enter the labour force and become more productive citizens.

In her days as an educator, Fonner saw this happen to her own students. "It is through this technology they can be independent, have employment, lives and families," she says. The technology allowed Fonner to "know what these students know." It also allowed her students to participate more actively in the classroom.

Marsden is often amazed by the path his career has taken. He grew up in the small town of Magrath in southern Alberta, where his father was a TV repairman and telephone lineman. He received a circuit kit for Christmas when he was 10, and spent the next year immersed in his present. He didn't settle on his chosen career until he was almost finished high school, when an aptitude test showed that he had the most potential in engineering. As a kid, he had thought engineers were the people who drive trains.

Professor Durdle, who has taught in the Faculty since 1982, remembers Marsden and Tanne being very energetic and motivated by the needs of their disabled friend. Other students have gone on to form companies based

on work they started during their projects, Durdle says, but he doesn't know of another that has had the success and impact of Madentec. It is generally difficult for companies to survive in rehab areas, a fact Durdle knows from experience—he had his own company that he had to wind down for economic reasons.

"There is a big need in our society for companies to take on these things," says Durdle. "The rewards are not that big—you don't have the world-wide market." But as he points out, many computer innovations in the mass market, including voice recognition, pop-up toolbars and speech synthesis, all had their origins in assistive technology.

Today, Madentec is branching out to new areas, some of which could eventually prove quite lucrative. One spinoff is called cleankeys, a touch-sensitive glass keyboard, similar to a microwave oven keypad. Studies have shown that more bacteria lurk between the keys of regular keyboards than on toilet seats. The cleankeys keyboard, which can easily be wiped off with disinfectant after use, is proving popular with doctors and dentists who would otherwise need to change gloves every time they tapped a keyboard. Marsden is also a co-developer of Swype, a new system that speeds up on-screen text-messaging using a pointer, and he is in discussions with cellphone companies about licensing the technology.

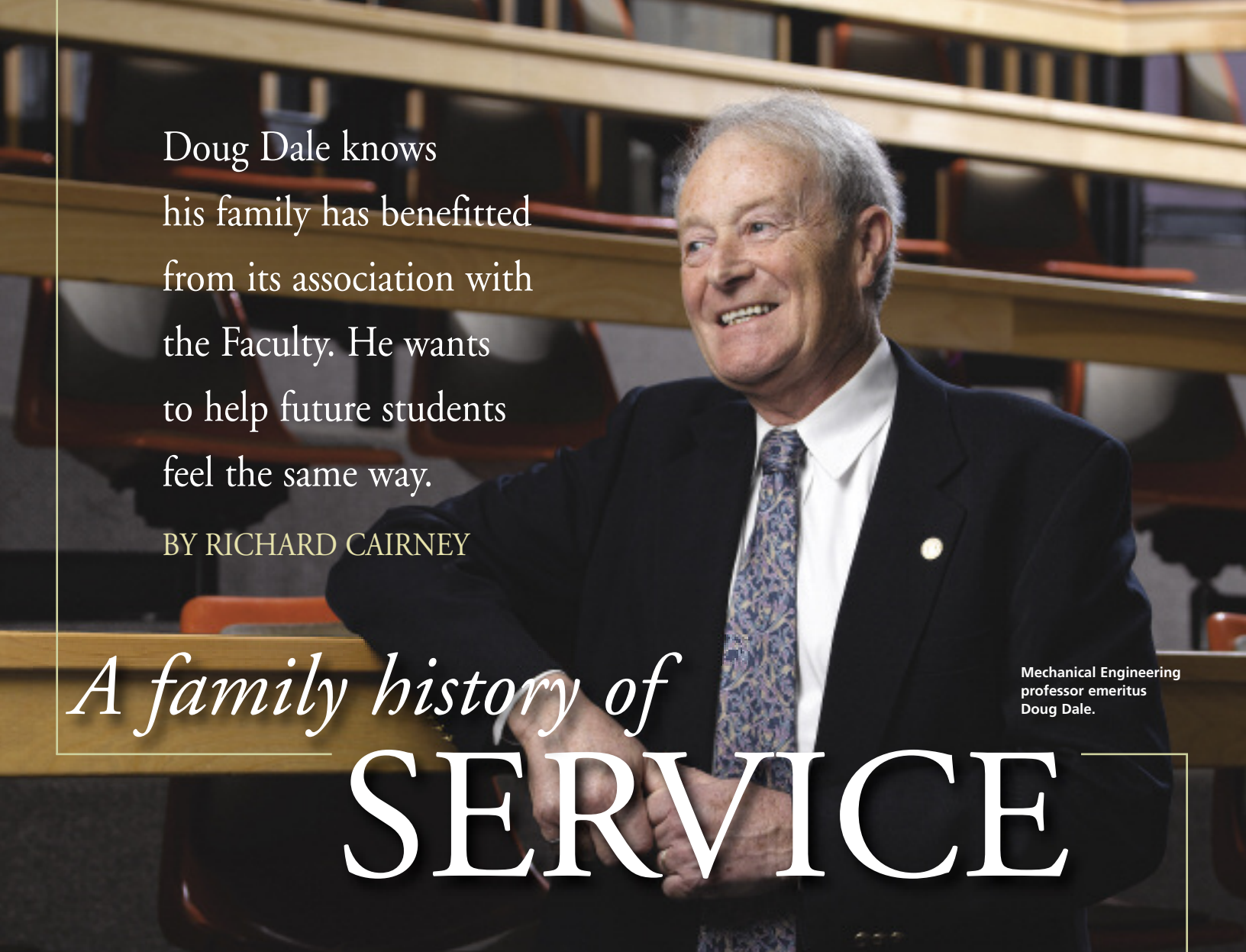
These new advances will likely have a positive impact on Madentec's revenue, which in turn will allow the company to devote more resources for serving people with disabilities. Assistive technology will always remain the core of Madentec, which won a prestigious ASTech Societal Impact Award from the Alberta Science and Technology Leadership Foundation in 2008.

"It's easy to get up in the morning when this is your job," says Marsden. "You have a lot of rewards but it's not like it's a mass market and you'll take off and make millions. It's enough to have a viable business and help a lot of people."

It has been an amazing journey, launched by a student's joyride down a sidewalk ramp.



After 28 years covering everything from crime to politics with the Edmonton Journal, Mike Sadava has embarked on a freelance career.



Doug Dale knows his family has benefitted from its association with the Faculty. He wants to help future students feel the same way.

BY RICHARD CAIRNEY

A family history of

SERVICE

Mechanical Engineering
professor emeritus
Doug Dale.

The way Dr. Doug Dale tells it, the Faculty of Engineering has benefitted his family for decades, spanning three generations. At the beginning of the Great Depression Dale's father, Graham, moved to Edmonton from Cranbrook, B.C., to study electrical engineering at the University of Alberta. Graham's decision to attend the U of A was pragmatic: rather than try to scrape by on his own elsewhere, he could live with an aunt in Edmonton.

Still, he struggled financially, leaving school to work and save enough money to complete his degree. After graduating, Graham spent a summer working for Northwestern Utilities (now ATCO Gas) as a surveyor and wound up in the company's employ for his entire career.

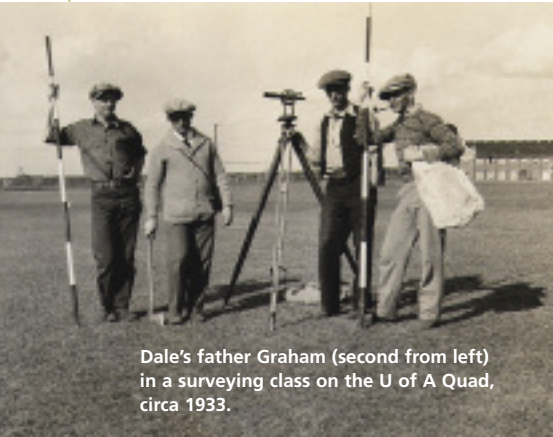
The Dale family's involvement with the Faculty of Engineering didn't end there. Doug

enrolled in the second graduating class in the Department of Mechanical Engineering, convocating in 1961. Campus was a different place then. There were about 7,000 students on campus—today in the Faculty of Engineering alone there are some 3,800 undergraduate and nearly 1,200 graduate students, and about 36,000 students in total on campus. The section of campus now occupied by the Faculty of Engineering was an orchard. Dale and his classmates wrote their Christmas and final exams in the uncompleted top floor of the then-new wing of the Engineering building.

Like his father, Doug worked as a surveyor during the summer. He staked out the sites for the Chemistry/Physics V-Wing complex, the new power plant behind the Jubilee Auditorium, and the fill-in for the Dentistry-Pharmacy Building and Education Building.

Dale worked as a surveyor for two summers. The job didn't set him on his father's career path, but it did solidify his relationship with his future wife, Lynn. Dale had met Lynn while both were on campus and, smitten, he decided one day to "just drop in" to see her at her home in Fort Saskatchewan while he was surveying there.

"She wasn't home, but I met her father, and she and I talked on the phone later and went out," says Doug. The relationship stuck, surveying went by the wayside, and Dale worked as an HVAC consultant for a period before returning to campus as the department's first master's student, specializing in thermal sciences. After working as a sessional instructor at the university and as a research officer at the Alberta Research Council, Doug and Lynn moved to Seattle, where Doug earned his PhD at the University of Washington.



Dale's father Graham (second from left) in a surveying class on the U of A Quad, circa 1933.

Courtesy Doug Dale

of Mechanical Engineering from 1990 to 1994 and again from 2000 to 2002. His research has had major impacts on science and society. In 1977 Dale and Electrical Engineering professor Dr. Peter Smy were the first to use a laser to ignite a gas mixture in a cylinder of a gasoline engine. The technology is now viewed as the only way to improve thermal efficiencies of large natural-gas-fuelled engines.

During the late 1970s Dale was part of a group that established the Alberta Home Heating Research Facility. Research findings from this facility resulted in changes to the National Energy Code, which in turn have saved Canadians at least \$100 million in energy costs annually.

Dale was also instrumental in upgrading testing standards for materials used in thermoprotective garments. Dale, Mark Ackerman (Mechanical '79, MSc Mechanical '83) of Mechanical Engineering, and Human Ecology professor Dr. Betty Crown were responsible for constructing the second mannequin garment-testing facility in the world.

Through volunteer activities of his father, Dale learned it was important to help society in one way or another. Among other volunteer activities, his father served as secretary to the Edmonton Art Gallery from 1947 to 1974.

Over the years, Dale has affected the lives of thousands of students as a teacher, administrator, and researcher. He's also aware of the financial challenges students face.

"When I was an undergraduate, there wasn't a lot of scholarship money around," he says. "Everything was means tested, and in our fourth year we took a poll of our class and found that they were graduating with debts equivalent to about one and one-half to two years' worth of an engineer's starting salary, about \$100,000 in today's terms."

Fifteen years ago Dale established a fund for student scholarship, and today that fund has grown large enough to distribute awards. He has also written a provision into his will that could benefit students even further. The "last survivor" clause directs the assets of his estate to the Faculty of Engineering, in the event that no other beneficiaries are alive to accept the inheritance.

Without such a clause, the federal government becomes the sole beneficiary, and Dale has simply exercised his option to direct where his assets will go.

"It's easy to say that it is nice to give back to society, to give to a society that supports higher education, to a society that benefits from higher education. A well-educated society just helps everyone. You live in a better place.

"Putting the University in your will doesn't take away from what you want to do with your estate," Dale says. "And I can't say that all educational institutes have ideals that I'd agree with, but giving to an educational institution like the U of A is pretty easy."

MAKING A BEQUEST

the simplest way to leave a Legacy Gift to the Faculty of Engineering

Bequests or naming the Faculty of Engineering in your Will are the most common legacy or planned gifts. The gift may be designated a number of ways:

- As a percentage of your estate,
- As a specific dollar amount or description of property,
- A residual of your estate or the percentage of the residual, or
- Contingent upon a certain event happening.

For more information how your estate can secure various tax saving, please contact the Faculty's Gift Planning Counsel, Nena Jovic-Andrejevic at 780-492-8969 or e-mail nenajovic-andrejevic@ualberta.ca.





Connect with 2009 Engineering Calendar

Thanks to our creative alumni who contributed to the 2009 Engineering Calendar Looking Forward.

Are you interested in contributing to the 2010 Calendar?

Next year's calendar theme is *Connections*. Send us high-resolution images that illustrate the idea of connectivity. For details on image size and how to submit images, e-mail Richard Cairney at editor@engineering.ualberta.ca.



You're invited ALUMNI WEEKEND 2009

All Faculty of Engineering events are FREE to alumni and their guests. Unless otherwise noted, events will take place in the Solarium, located on the 2nd floor (Maier Learning Centre) of the Engineering Teaching and Learning Complex (ETLC).



Alumni Weekend brings our Faculty of Engineering family together. Here, Howard Moss (Civil '58) tries his hand at the Punch Punch Revolution System, an Electrical Engineering student project.

Individual Class Gatherings

Many Engineering reunion classes will be holding private class dinners, social evenings, or other events throughout Homecoming Weekend. For information on individual class events, please call your department contact as noted below:

Chemical, Materials, Metallurgical

Leanne Nickel 780-492-4159
or leanne.nickel@ualberta.ca

Civil, Environmental, Mining, Petroleum

Stephan Bogner 780-492-4004
or stephan.bogner@ualberta.ca

Electrical, Computer, Engineering Physics

Jamie Reid 780-492-8351
or jamie.reid@ece.ualberta.ca

Mechanical

Linda Kelly 780-492-4160
or linda.kelly@ualberta.ca

Class of 1949 Engineering Alumni Luncheon

Friday, Oct. 2, 11 a.m. - 2 p.m.

Dean's Engineering Reception

Friday, Oct. 2, 4:30 - 7 p.m.

Dean's Engineering Alumni Brunch

Saturday, Oct. 3, 9 - 11 a.m.

Open House, Tours, and Lectures

Saturday, Oct. 3, 9 a.m. - 4 p.m.

Place: Engineering Teaching & Learning Complex (ETLC), Maier Learning Centre (ground and 2nd floors)

An information booklet will be mailed to alumni in late April. For further information visit www.engineering.ualberta.ca/alumni

Nanyang Technological
University President
Guanning Su embraced his
engineering education
experience, from working
on a farm during the
summer to developing
a radar system well
ahead of its time.

BY PHOEBE DEY

A portrait of Guanning Su, the President of Nanyang Technological University. He is a middle-aged man with dark hair, wearing glasses, a dark suit, a white shirt, and a red patterned tie. He is smiling and looking towards the camera. His hands are clasped in front of him. The background is a blue grid pattern.

From international student to
**university
president**

L-R: John Foong, Guaning Su, and Foong's mother during 1971 spring convocation.

Courtesy Dr. Guaning Su



Even 38 years later, John Foong (Electrical '71) remembers sweating nervously over a math exam and looking up to see his relaxed-looking classmate, Guaning Su (Electrical '71), hand in his paper and breeze out the door. "I'm still just trying to understand the question and he was already done," says Foong.

Not only did Su usually finish first, he finished on top. Writing his mathematics exams in pen ("he didn't make any mistakes," says Foong), Su went above and beyond the call of duty. If an instructor required the students to fill out six of 10 questions on a test, Su would complete all 10 of them and get them all right, says Foong.

"He was head and shoulders above everyone else," says Foong. "We expected great things from him."

And he delivered. Today, Dr. Guaning Su is president of Nanyang Technological University in Singapore, following an illustrious career helping to shape his country's national defence. But his academic path started at the University of Alberta in 1967.

As a recipient of a Colombo Plan Scholarship, Su was chosen to study in Canada. He admits he knew little about the country at the time and even less about Edmonton or Alberta, except that it was cold. "I have a vivid memory of landing in Canada, in Vancouver, and finding bright sunshine and big cars, and then later landing

at the Edmonton International Airport and wondering where the city was," says Su. "The airport was quite far from downtown, and all I saw were fields. I remember wondering if the city was underground due to the cold winter."

Before he came, Su learned Canada was bilingual. So, ever the diligent student, he studied French at the Alliance Francaise in Singapore to prepare. Of course, Alberta turned out to be quite different than he expected, and the relative absence of French was just one revelation. "I was surprised to learn that Ukrainians were a significant ethnic group," he says. "And at the time Premier Ernest Manning maintained a ban on movies on Sunday.

"Lots of people in our crew were bright, but he was a step above. He was getting straight nines while everybody else was trying to play catch up to him."

— ALAN HAWRELAK

"But everything was so new and wonderful. In those days Singapore was a Third World country and Canada already a very developed country. And it was so warm indoors, whatever the weather outside. My parents were sur-

Nanyang Technological University



Nanyang Technological University



Courtesy Dr. Guaning Su

Guaning Su today (centre, above) with the Nanyang Technological University dragon boat team. Below (front row, second from right), with a dragon dance group in Edmonton.

prised at my photos in the Henday Hall dorm room when I was wearing shorts.”

Su spent his first two years on campus in Lister Hall and then shared a house off campus. He still keeps in touch with his former classmates and his tight-knit group of friends. Dr. Dominic Leung (Chemical '71) shared most of his first-year classes with Su and knew, even then, he would make a name for himself. “He was very smart, very courteous and helpful to everyone, when he could have been arrogant,” says Leung, now a physician in Edmonton. “He was very different from other people we knew, and I really looked up to him.”

Alan Hawrelak lived with Su in residence and then later in rented houses. “He could take some ribbing, because we called him Su,

which eventually led to us singing ‘A Boy Named Sue’ to him,” says Hawrelak. “But mostly he was a level-headed guy. Lots of people in our crew were bright, but he was a step above. He was getting straight nines while everybody else was trying to play catch up to him.”

Su enjoyed a good laugh but didn’t horse around as much as the Canadians, says Foong. Whenever someone had a birthday in residence, for example, the other floor-mates would fill up a tub with water and throw the person in. When it was Su’s turn, he simply climbed into the cold bath on his own accord. “He said, ‘there’s no way I’ll be able to fight off a group of you so I might as well get it over with,’” says Foong. “He was too logical.”

Su embraced Canadian culture, attempting to learn how to skate and ski, and taking road trips when he could. On one such holiday, the young crew was carefully searched when crossing the U.S. border on a trip to Yellowstone National Park (“I think it was because of Al Hawrelak’s long hair at the time,” says Foong).

After the first year, Su and three other Singaporean Colombo Plan Scholars approached Foong, telling him they wanted to soak up as much of Alberta as possible. Foong suggested heading south, since he lived in Lethbridge and knew many Mennonite and Japanese farmers around the Vauxhall area. The young, perhaps naïve, men piled in Foong’s white VW Beetle and drove to a beet farm.

“I dropped them off and then came back to visit them a week later and they said, ‘Damn you, Foong, why did you leave us here?’” says Foong, laughing now. “It nearly killed them. It was hard work.”

Even so, Su still manages to find something positive about the experience. “For a few weeks, the four of us spent our days working under the scorching sun, hoeing unending rows of sugar beets,” he says. “The pay we received was a pittance, but the experience was something I found worthwhile, as many of the migrant workers at the job were aboriginals and I got to know them well. It was something I would not get to experience otherwise.

“And the endless prairies were something to behold.”

While at the U of A, Su became interested in research. As project chairman of the IEEE students' branch, he led his team to receive a Vincent Bendix Award for their proposal to build a collision avoidance radar. However, the idea was ahead of its time. Only today, nearly 40 years later, are such radars becoming technologically feasible, says Su. Even so, the students managed to build the circuits.

After graduating from the U of A, Su entered graduate school at the California Institute of Technology, studying electrical engineering. He had finished his master's, completed his PhD qualifying exams, and was on the verge of starting his work on integrated optics with Dr. Amnon Yariv, an authority on lasers and optics. Then, Singapore suddenly requested he return to the country. It might have been a missed opportunity—Yariv went on to start an optical device company that he later sold to Lucent for \$2 billion—but Su tries not to dwell on this fact.

Back in Singapore, Su started working on radars and electronic warfare with the Ministry of Defence, which was more interesting work than the normal compulsory military service. In those days, radar was mostly analog. So, when Su had a chance to

do his PhD in 1980, he went to Stanford University and focused on signal processing relevant to radar and communications.

When he returned to the defence research and development laboratory in Singapore three years later, he tried to squeeze in whatever time he could on his own research. But he devoted most of his effort to boosting the laboratory's reputation for innovation, allowing Singapore to collaborate with other countries on research projects.

He also worked as an adjunct engineering professor at the National University of Singapore in 1991, and later taught management of technology at the University of Singapore Business School from 1998 to 2000. He organized his laboratories to become a not-for-profit corporation, DSO National Laboratories, serving as chief executive. And he somehow found time to work in a post-graduate program in business administration at the University of Singapore and Harvard Business School.

Su was also appointed deputy secretary (technology) in the Ministry of Defence, heading the procurement, IT, construction and R&D funding arm, the Defence Technology Group. He would stay with the ministry until 2002, when Nanyang Technological University began a worldwide search for a new president. His name was submitted and, in July of that same year, Su was offered the job.

Despite earning an international reputation in the field of defence, Su decided to return to academia. Since the inception of his term, he has raised the profile of NTU, made up of 20,000 undergraduates and 8,700 graduate students from around the world. The institution is ranked among the top 25 technology universities globally.

Su says his work with the government and as a researcher taught him that the quickest way between two points is not necessarily the straight line. "I learned a lot more about human behaviour and especially managing outstanding engineers and scientists," he says. "It was useful preparation for my role as president of NTU, but there was much more to learn. Academia is very different from corporate life, and academics are much more complex than corporate engineers and scientists."

"For a few weeks, the four of us spent our days working under the scorching sun, hoeing unending rows of sugar beets. The pay we received was a pittance, but the experience was something I found worthwhile, as many of the migrant workers at the job were aboriginals and I got to know them well."

— GUANING SU

Next, Su would like to continue laying the groundwork for a "truly great university" by rebuilding the university governance systems and processes, and by recruiting innovative and creative people. Singapore is in a unique position along two axes, Su says—on one side, the cultural fusion between East and West, and on the other, the research and innovation needed to create a knowledge-based economy.

"I would like to build our university into a central driver in both these axes and in doing so, leave a legacy for future generations," he says. "My present role as president of NTU is a great challenge. My goal is to completely transform it from a large, teaching-dominant engineering university to one of the outstanding universities in the world, with great research and teaching in a wide range of disciplines. This will take time to accomplish and we are just in the middle of the process."

Looking back on his career, Su has much to be proud of but he points to his 30 years in the defence community where his contributions, many of them classified, help make his country more secure. "This provides a strong foundation on which to build political stability, prosperity and happiness."

Su credits the U of A for his own strong foundation, helping him to build the sound fundamentals needed to excel in his graduate study and subsequent career. "To this day, returning to Edmonton gives me a warm glow from inside—even if it's 40 below outside. I made lifelong friends and the memory there lasts a lifetime."



Phoebe Day is an Edmonton-based freelance writer.



NTU Campus is a sight to behold. Above, the elegant Nanyang Auditorium; below, a bird's-eye-view along the North Spine Complex.

the guru of gadgetry



Courtesy Pete Pachal



Pete Pachal (Eng Phys '96) is editor of DVICE.com, a tech blog that reviews the very latest in technology, from solar-powered submarines to home electronics. Although he isn't working as an engineer, Pachal credits his engineering degree and the problem-solving skills it equipped him with for the direction his career has taken.

What has your career path been from graduation until now? When did you decide on media-journalism?

After graduating from the U of A, I took an entry-level job at an Edmonton firm that had big dreams but seemed to lack the wherewithal to execute. Thanks to my experience as an editor of the *Gateway*, I was assigned the task of producing the company's business plans. I also did a lot of writing on the side for various publications around Edmonton, like *SEE Magazine*.

My day job was unsatisfying and, after a year, I resolved to apply to journalism school. I began attending classes at the University of

Pete Pachal followed his passions, and advises young alumni to do the same

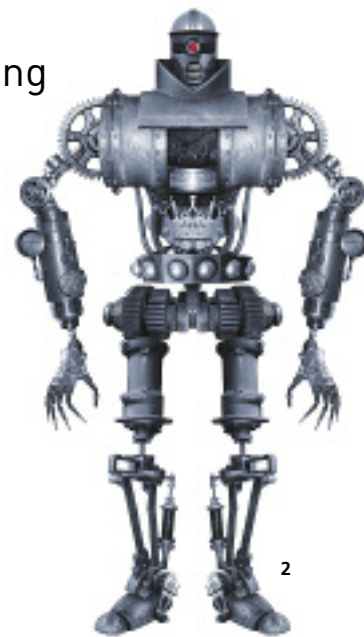
by Richard Cairney

King's College in fall 1998. During my year at King's, I worked as an intern for *New York Magazine* for a month and a half, which galvanized my desire to move to New York City and work in the media business. After graduating King's, I moved back to Edmonton to sort of "regroup," then moved to New York in October 1999.

When I arrived in Manhattan, all I had was about \$400 and a MasterCard. Three weeks later I had found my first job in NYC, assistant managing editor of *Sound & Vision* magazine. I worked at that publication for six years, rose through the ranks, but began to lose interest. While searching for a different job, I happened to interview at the SCI FI Channel when they were in the process of creating a tech blog. They hired me to run it. Since then, it's grown a lot, and now DVICE garners over 750,000 unique visitors every month.

How did your education or experience at the Faculty of Engineering and the U of A equip you for your career path?

My time spent at the *Gateway* wasn't just extremely beneficial to my journalism



career—it sparked it. I didn't intend to become a journalist when I started at the U of A. But my engineering degree certainly has shaped the kinds of jobs I've had: *Sound & Vision* was a magazine dedicated to A/V equipment, and DVICE is about technology of all kinds.

Having an engineering background is helpful for DVICE in particular. Often, tech companies try to oversell their products, touting some esoteric tech feature. With my technical knowledge, I'm in a better position to call out their BS. If some startup claims they're going to create a battery that lasts 50 years, for example, I just inherently know that something's not right.

Just some of the gadgets featured on DVICE. Previous page: 1) Vuzix video eyewear; 2) Steampunk Cylon contest character. This page: 3) quirky concept bus for London; 4) the DVICE website; 5) the Robotrac multipurpose robotic farmhand; 6) TeleNav full-featured GPS navigation system for Android; 7) the Noah personal vehicle.



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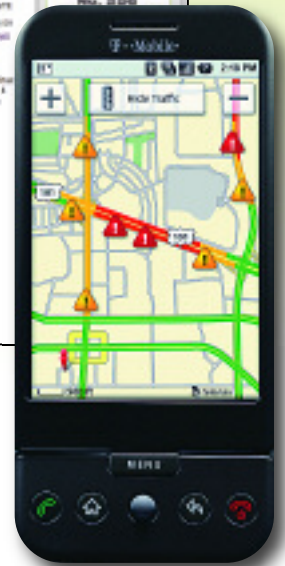


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All gadget images courtesy DVICE

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What unique professional challenges do you face daily, and how do you measure success?

The most challenging thing is continually finding ways for DVICE to stand out among tech blogs, and as a brand of NBC Universal. We try not to give predictable stuff, but it's challenging; the blogosphere is very oversaturated now.

iPhone or BlackBerry?

iPhone all the way, baby! The apps are so much fun!

PC or Mac?

Mac, definitely. Better in every way, unless you're a gamer.

What's the next big thing?

Organic Light Emitting Diode (OLED) TVs are going to take off in the next couple of years.

What's your proudest achievement, personally, professionally or socially?

Moving to New York with little money and no real job prospects, and finding myself with a job and a place to live just a few weeks

later. It's been quite an adventure. I just wish that first job was as good as editing DVICE. Editing a blog is so much fun—you never know what cool tech stories will come up on any particular day.

What fosters pride for you as an alumnus?

Seeing the campus when I come back to the city, hearing about the Bears and Pandas when they win championships, and reading the *Gateway* online.

What emotional/sentimental/intellectual/professional connections do you have with the Faculty of Engineering and the U of A?

I'll always remember Fred Vermuelen as one of the best teachers I ever had at any level. And

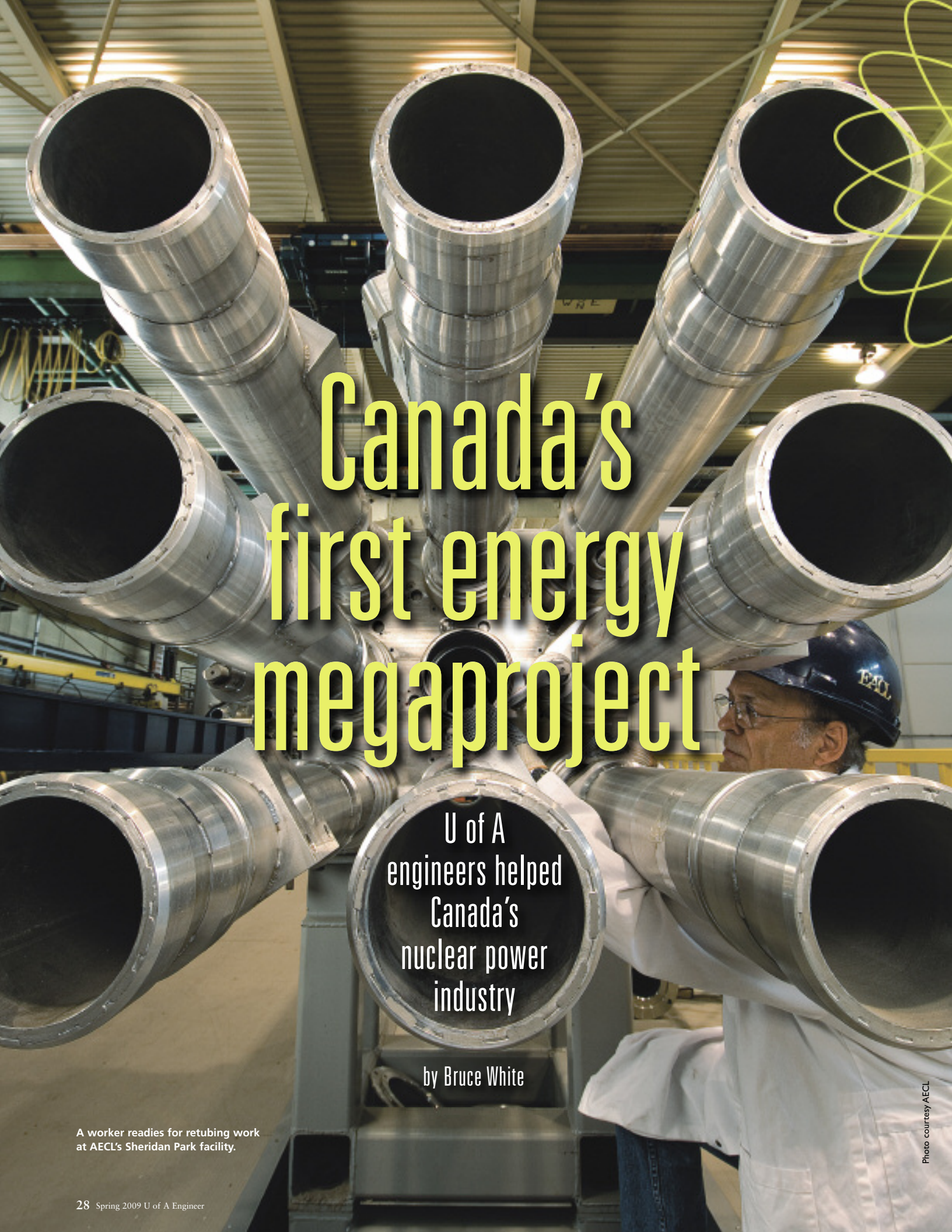


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my engineering education has certainly made me look at the world differently every day. When parking on an icy incline, for example, I'll wonder what the coefficient of friction is for the ice and how much my car weighs, thinking about whether or not it'll slip. It's not like it helps me predict whether my car is actually going to start sliding around, but at least I know how to express what's going on in practical, problem-solving terms.

What messages do you have for potential students, undergraduates, and young professionals who are just starting their careers?

Don't be afraid to take control of your career path. When they're just starting out, I think a lot of new grads think they have to take whatever comes their way, especially in this economy. Don't just take or do whatever's in front of you. Often, decisions that you intend to be "temporary" end up lasting a lot longer than you ever imagined. Consider things carefully and take the route that feels right to you. Of course, be realistic, but don't settle for something that isn't really what you want to do. You probably have more options than you think.

A photograph of a worker in a white lab coat and blue hard hat working on large metal pipes in a factory setting. The pipes are arranged in a circular pattern, and the worker is looking at them. The background shows industrial equipment and a ceiling with lights.

Canada's first energy megaproject

U of A
engineers helped
Canada's
nuclear power
industry

by Bruce White

A worker readies for retubing work
at AECL's Sheridan Park facility.

Today's development of the Athabasca oil sands is among the largest engineering projects in Canadian history. But, a generation ago, an energy development took place that was every bit as important for its contribution to the country's economy and technological advancement.

From the late 1960s through the early 1990s, 22 Candu reactors were built in Ontario, Quebec, and New Brunswick to generate electricity. If they all were to be built today, Canada's Candus could cost as much as \$150 billion—an amount similar in scale to the investment currently contemplated for the Alberta oil sands.

Like the oil sands, the Candu grew out of a desire to exploit uniquely Canadian resources. Our fresh water yields heavy water: about one water molecule in 10,000 carries deuterium (heavy hydrogen) atoms with an extra neutron. The Canadian Shield has substantial deposits of uranium, which in nature is more than 99 per cent U238; about 0.7 per cent is the highly fissionable U235 isotope. Canada had no desire to get into the production of enriched uranium, which could be used in nuclear weapons.

What evolved out of necessity turned out to be “a fantastic system,” says Bob Hemmings (Chemical '62). The Canadian deuterium uranium reactor technology was based on the principle of using heavy water to slow down the neutrons, permitting a controlled fission to be sustained using natural uranium fuel.

Although the Candu's roots date to wartime research at Chalk River, Ontario, development of the peacetime technology later branded CANDU began in earnest in 1954. That year Ontario Hydro and Atomic Energy Canada Ltd. (AECL) joined eight other utilities, engineering, and manufacturing firms in a consortium to design and build reactors that were meant to be economically competitive with coal as a source of steam to generate electricity.

As with the oil sands today, thousands of Canadian engineers, including graduates from the University of Alberta, enjoyed rewarding careers in Canada's nuclear industry. They worked on research reactors at Chalk River and in Whiteshell, Manitoba, and commercial

generating stations at such places as Pickering, Ontario; Gentilly, Quebec; and Point Lepreau, New Brunswick. The opening in 1968 of a 220-megawatt power-generating unit at Douglas Point, Ontario, marked the beginning of commercial nuclear power in Canada. That took place one year after the first viable oil sands plant was up and running near Fort McMurray.

Four decades later, both industries face similar challenges as they mature—high capital costs and serious concerns about environmental impacts—but in the go-go years around Canada's centennial, optimism seemed limitless.

Jim Saltvold (Electrical '64) spent 39 years at AECL, mostly involved with research and development. He joined the industry in 1967, when many people in the industrialized world saw atomic energy as the thing of the future.

“You felt there was prestige,” Saltvold recalls of his early days. “The glamour was still there, and there was still quite a bit of public support, but that diminished rather quickly.”

Saltvold earned his master's at the University of Wisconsin and worked in R&D at research reactors in Whiteshell and Chalk River, and raised a family in the company town of Pinawa, Manitoba, and at Deep River, Ontario. While at Whiteshell, Saltvold and his colleagues developed special-purpose instruments for use in reactors—“anything you couldn't buy off the shelf,” he explains.

One was a device to measure internal friction in specimens of the metal used for reactor pressure tubes and fuel cladding, to study defects and their interaction. (Internal friction is what causes a vibrating flat spring to stop vibrating.) Another was an automated device to measure the diameter and profile of the pins in a fuel bundle that had been irradiated inside a reactor. The device dramatically reduced the amount of time that technicians needed to spend making these measurements by hand in heavily shielded containment boxes known as “hot cells.”

Hemmings, who earned his PhD at the University of London, arrived at Whiteshell two years before Saltvold and worked with a company-wide team on a problem that plagued early reactors: the migration of radioactive corrosion products within the reactor's heavy-water core and light-water cooling systems. Tiny amounts of oxides

would accumulate on uranium fuel, become radioactive, and then break away to build up again in undesirable places within the reactor's zirconium guts. That buildup created extreme radiation levels in the boiler room at Douglas Point after only three years of operation.

As a chemical engineer working on R&D at Whiteshell, Hemmings helped to identify the chemical bases that were used to create a decontamination system known as CANDECON®. That process used small concentrations of organic acids to dissolve the oxides, which were then removed from the water by a purification system. The system reduced the radiation problem at Douglas Point by a factor of six, and was employed in later Candu designs and marketed internationally.

After two years on site for the commission-



Photo courtesy AECL

Workers at AECL's Sheridan Park facility prepare for remote tooling development.

ing of the Gentilly-1 reactor in Quebec, Hemmings moved during the early 1970s to the Toronto area, where most of AECL's design work was going on in Mississauga, Ontario.

There was never one Candu reactor; rather, over the decades a series of models evolved, each delivering more capacity and better performance. Hemmings worked on Ontario Hydro's Pickering and Bruce projects before moving to Montreal in 1975 to open AECL's new Candu-6 reactor design office. Later, he joined Canatom Ltd. (now part of SNC-Lavalin) to continue to work on the design of Candu-6, a second-generation series. These were commissioned at Gentilly-2, Point Lepreau, and Darlington as well as

for international customers in countries including Argentina, Korea, and Romania.

Hemmings' friend Jerry Sovka (Chemical '58) is another nuclear engineer from Alberta. After earning a PhD from MIT, Sovka also worked in R&D for AECL, then moved into design work for Ontario Hydro's nuclear systems group through the commissioning of Douglas Point, Pickering, and Bruce.

Demand for engineers—especially on the design side—was dependent on the state of the company's order book for Candu reac-

the industry will face a serious shortage of talent for years to come, as the older generation of nuclear engineers retires, reactors currently in service come up for midlife refurbishment, and new reactors are eventually built.

tors. By the 1980s, domestic demand for nuclear power dried up, due in part to cost overruns and a growing public fear of atomic energy, especially in the wake of the 1979 Three Mile Island event in Pennsylvania and the 1986 Chernobyl catastrophe in Ukraine.

During this employment drought, Hemmings found a series of opportunities in the U.S., starting at Niagara Falls, New York, in a successful venture with an SNC company (London Nuclear) to commercialize CANDU technology in the States. In the post-Three Mile Island environment, he also worked on a dozen "prudence audits" of U.S. reactors. These studies were done in response to heavy regulation of the industry and were meant to sort out which proposed safety measures were prudent and which were unnecessary. Canadian engineers, with their roots outside the U.S. nuclear establishment, were seen as reliable, unbiased, and competent for this work.

Sovka's career took on an international arc after he joined Canatom to work in project management on Candus in South Korea and China. He left the industry briefly to run an international telescope in Hawaii before returning to the nuclear world in the 1990s to work on a proposal for Canada to host an experimental fusion project known as

ITER (for International Thermonuclear Experimental Reactor), a project that also involved Hemmings.

"Canadians worked very hard to get the ITER project built in Canada instead of France," Hemmings says, blaming federal politicians for refusing to support the project. He adds that the jobs created and taxes collected would have more than repaid the investment in the multinational research project.

Sovka joined the multinational fusion research project ITER in 2001, first taking over an assignment from Hemmings in Japan and then moving to Bavaria and, recently, Provence. Now 72 years old, Sovka leads the site preparation team, which will achieve a milestone this summer when excavation begins for buildings housing the 10-storey-high fusion vessel known as a tokamak. His work involves travel among the ITER group's partners in Asia, Europe, and the U.S.—resulting in what he calls a lot of "short nights," such as reporting to the office at 3 a.m. for a teleconference hosted in India. The project aims to produce its first fusion plasma in 2016.

Hemmings continues to work in the industry. His current projects include commercializing a Canadian technology that removes tritium (^3H or hydrogen with two neutrons) from heavy water.

Saltvold continued in R&D, having moved to Chalk River. He left the industry in 2005 after four years on loan to Ontario Power Generation (formerly part of Ontario Hydro) to work on site at Pickering, and is now semi-retired.

The Camrose native lives in Red Deer and works part-time for Stantec on municipal water and sewage projects around Alberta. "One thing I find now is that it's easier to explain to people what I do than it was when I worked in the nuclear industry," he says with a chuckle.

Saltvold and others believe that the Candu, launched when Canada had fewer than 20 million people, has created a tremendous national legacy. It accounts for about one-sixth of the electricity currently produced in Canada, including half of Ontario's power.



Photo courtesy AECL

The Whiteshell Nuclear Research Establishment (Whiteshell labs) in Manitoba.

It created business spinoffs for large industrial companies such as Canadian General Electric, expanded the market for Canadian uranium, and built expertise in advanced manufacturing. The industry also provided solid careers for thousands of engineers.

In recent years, as concern has risen over the carbon generated by coal-fired power plants, many people in and around the industry have predicted a renaissance of what's

described as "clean" nuclear energy. Proposals are being considered to build third-generation ACR-1000s in northern Alberta or west-central Saskatchewan to provide power to the oil sands industry, similar to a plan that Hemmings remembers pitching unsuccessfully in Calgary during the 1970s. (See sidebar.) So far, these environmentally motivated



Bob Hemmings (Chemical '62)

orders for new Candu reactors have failed to materialize.

Nevertheless, the Canadian Nuclear Association and its U.S. counterpart predict the industry will face a serious shortage of talent for years to come, as the older generation of nuclear engineers retires, reactors currently in service come up for midlife refurbishment, and new reactors are eventually built.

Hemmings encourages young engineers to consider the field. He describes his career as "a fantastic career that took me to all kinds of places—chemical engineering applied to nuclear energy."



Bruce White is an Edmonton-based business writer and editor. (bruce@bizedmonton.ca)

Alberta's nuclear future debated for decades

Almost four decades ago, a distinguished University of Alberta scientist addressed the province's energy future in the light of the M. King Hubbert theory of petroleum depletion, which forms the basis of today's "peak oil" theory.

In 1971, Dr. Robert Folinsbee, a native Edmontonian and wartime RCAF pilot, was a professor of geology and former head of that department. His honours would later include the Order of Canada and the presidencies of the Geological Society of America and the Royal Society of Canada. Folinsbee's conclusions about energy in Alberta are surprising, especially given the way the province has developed in the 38 years since he wrote his paper.

"It is clear that Canada will make only a small splash in the world's petroleum pool, and that the fossil fuels will be only a short interlude on the rocky road of modern man. Energy for the future must be nuclear, and cars electrical," Folinsbee wrote.

"The donut cloud of a major oil field coming into production, as at Redwater in 1950, may not be seen again over the Prairies. For the genie of the energy lamp of the future will be nuclear. Let us work to make him a good genie, confined to his cauldron, so that this blue planet that is Earth may remain a fit abode for all mankind."

Folinsbee certainly underestimated the role the oil sands would have in "the world's petroleum pool." He likely did not foresee that nuclear energy would be more controversial today than it was during the early 1970s. And he had no way of realizing that the yet-unappreciated threat of global warming would make the burning of hydrocarbons for energy equally controversial. Yet, ultimately, he may be proved correct about atomic energy playing a role in Alberta's energy future.

The fission of very large atoms into smaller ones remains a tantalizing source of power; splitting one uranium atom releases approxi-

mately 50 million times as much energy as the burning of one carbon atom. That is being promoted as the solution for Alberta's growing electricity needs, especially for the oil sands industry. Ontario-based Bruce Power, the country's only private-sector reactor operator, is developing plans to build multi-billion-dollar power plants in northern Alberta or west-central Saskatchewan, possibly employing newly designed ACR-1000 reactors.

Federally owned Atomic Energy of Canada Ltd. is developing the ACR-1000 as the third generation of the Candu series, which it promotes as having produced safe, carbon-free electricity for more than 40 years. The company highlights a number of new design features that it says make it more reliable and economical than previous generations of Candus:

- The ACR-1000 is a cost-competitive nuclear reactor that will produce 1.2 gigawatts of electricity, more than twice the output of the 1970s-era Candus at Pickering.
- It can be refuelled while online, resulting in higher operating efficiency.
- Its design, based on the Candu-6 that has been built for customers on four continents, incorporates the latest safety features.
- The ACR-1000 uses low-enriched uranium and alternative fuels, including blends containing plutonium recycled from decommissioned nuclear weapons.
- Slightly enriching the uranium makes a smaller reactor footprint possible. It also reduces the amount of nuclear waste per watt of electricity produced.
- The use of ordinary "light water" as a coolant will reduce the need for costly heavy water, which is still used as a moderator (slowing uranium neutrons to allow fission to take place).

However, Dr. Mark Winfield, an assistant professor of environmental studies at York University, disputes claims that nuclear ener-

gy is clean. He points out that greenhouse gases and contaminated wastewater are produced during reactor construction and in the mining and processing of uranium.

"Each stage of the nuclear energy production process, from uranium mining to power plant operation, generates large amounts of radioactive and otherwise hazardous wastes that will require care, in some cases for hundreds of thousands of years," he wrote in a 2008 article for the Pembina Institute. Winfield says nuclear energy also creates security, safety, and weapons proliferation risks unlike any other energy supply options.

He also questions the economics, noting that consumers in Ontario are paying off a multibillion-dollar "stranded debt" through a monthly charge on their electricity bills. Existing reactors require large, midlife refurbishments such as the \$5.25-billion project currently underway at Ontario's Bruce plant. Builders of new projects (only one is under construction in the western world, in Finland) not only contend with steep cost overruns, but also a very long time horizon.

"Given a 10- to 15-year planning and construction horizon, and a 60-year facility life, you are committing your system to that path for 70 to 80 years," Winfield said recently. "This is not necessarily a wise choice, given the pace of technological developments on the alternatives such as renewables, conservation and demand management, carbon capture and storage, and so on."

Folinsbee died last year at the age of 91, but his vision of Alberta's energy future still generates debate. General Motors plans to mass-produce fully electrical cars in less than a decade, which would mark a turning point towards his prediction that electricity will displace petroleum on the roads. As for Folinsbee's belief that atomic energy will be the source of that electricity—it could be another 40 years before we finally know whether or not he got that call right.

Gary Wicentowich returned to campus to watch the carnage at the annual Engineering Head Shave. The event's roots stretch back to 2003, when Gary's father, Ron, was diagnosed with cancer.



the gift

A modest plan to raise \$1,000 has taken on a life of its own

by RICHARD CAIRNEY

By the time Ron Wicentowich had been diagnosed with stomach cancer, in September of 2003, it was too late. Exploratory surgery revealed that the disease had spread and Ron's prognosis was grim. Two of Ron's sons, Gary and Graeme, were studying at the Faculty of Engineering. Gary was in his third year, having chosen Electrical Engineering as the discipline he'd follow. Graeme was in his first week of studies, trying to adjust to university life, when Ron was originally diagnosed. As the news sank in, the family was understand-

ably shaken to its core, its very foundations rattled. It is during such times that friendships and community strengthen and unite us all.

Without the family's knowledge, a group of Gary and Graeme's friends began organizing a cancer fundraising event in Ron's name. They planned to take pledges, then shave their heads, and donate the funds to the Alberta Cancer Foundation (ACF).

"Friends of mine who I'd known since elementary school started this," says Gary. "And a group of my engineering classmates got involved too. They tried to organize it as

a surprise, but word got out and after that even more people got involved."

Southgate Centre shopping mall donated space for the November event, dubbed Razored for Ron, and a barbershop in the mall donated its time. The Hudson's Bay department store dragged out a large recliner for Ron to relax in and watch as family, friends, and strangers lost their locks. The goal was to raise \$1,000. The event achieved much more, collecting nearly \$12,000 for the ACF.

"It was pretty amazing. Even our three-year-old cousin came and got shaved. Dad's

The Engineering Head Shave has flourished, becoming an important part of the Alberta Cancer Foundation's fundraising events and raising an impressive \$146,603 for the Cross Cancer Institute over the past five years.

friends from work—guys in their 50s who had hardly any hair—came. Two girls showed up and had their hair shaved,” says Gary. A young woman, a U of A student passing by, asked about the event, then started her own fundraising drive. She raised about \$800 and shaved her head a month later. “We’d never met her before,” says Gary.

The fundraising took on a life of its own. Some of the Razored for Ron event organizers planned another event, Rockin’ for Ron. Local bands played on campus at the Power Plant in a fundraiser for palliative care at Edmonton’s Grey Nuns Hospital.

“There was this one guy there with these long dreadlocks. He shaved his hair,” says Gary.

Ron passed away in February 2004. He had been, says Gary, “really touched” by the fundraising events that sprang up on his behalf. “We’ve always been pretty philanthropic through the years as a family,” says Graeme. “We’d done the MS Bike Tour, the

Terry Fox Run, the Jingle Bell Run, and some work for Habitat for Humanity.” So the following summer, Razored for Ron became an annual event, now known as the Engineering Head Shave. “It was June or July when we decided to organize this—that was the last time I got my hair cut, until it was shaved,” says Graeme. “For a few years there, the Head Shave was the only haircut I’d have every year—I’d just grow it out.”

The Engineering Students’ Society took on the job of organizing the event and, in November of 2004, with approximately 40 participants, the first annual Engineering Head Shave was held, raising close to \$13,000. It was also the first year the event incorporated a hair dye—and for the first two years, students would assemble at the Wicentowich home to watch football and dye their hair, leaving a pink tinge to the bathtub.

The Engineering Head Shave has flourished, becoming an important part of the ACF’s fundraising events and raising an impressive \$146,603 for the Cross Cancer Institute over the past five years, says Charissa Spencer, an annual fund development officer with the ACF.

“Without the support of events like this, many of the projects and pieces of equipment that make the Cross a world leader in cancer care and research simply would not have become a reality,” says Spencer. “We are deeply grateful to the organizers and participants of this event, and we are so proud that 100 percent of the funds that they raise stay not only within the province of Alberta, but right here within Edmonton at the Cross Cancer Institute.”

Gary and Graeme, naturally, feel some ownership of the event. They were heavily involved in organizing the Head Shave until 2008 when they took a step back from the event (they were busy establishing their own careers and, on their free time, running a drafting company of their own). “It has never been just Graeme and me on the committee,” says Gary. “We prefer to give the ESS all the



2008 Engineering Head Shave participants Curtis Sand (above), and Elizabeth Dunning-Smith (bottom left) sacrificed their hair to help raise funds for the Alberta Cancer Foundation.

credit anyway. There were just a few of us at the beginning and it has really bloomed.”

But Ron’s sons remained involved. Gary attended the 2008 Engineering Head Shave, visiting with friends, but passed on the actual hair cut. “I was starting a new job a week later, and just chose not to do the Head Shave this year,” he says.

Graeme, meanwhile, was working on contract in the Czech Republic, and had made a pact with one of his cousins back home: both men grew “unwieldy” beards and took pledges from family members to either shave their heads, shave their beards but continue to wear moustaches, or shave their beards and moustaches completely. Back home for Christmas 2008 and clean-shaven, Graeme reflected on the enduring impact of that first fundraising event.

“It’s really great that even though it’s called the Engineering Head Shave, you get students and faculty members and employees from all over the university taking part,” he says. “It kind of feels like a legacy now, and a tribute.”

U of A Creative Services



$$P = \frac{RT}{v-b} - \frac{a}{v(v+b)}$$

State of

MIND

by Andrea Collins

Your Grade 10 teacher was right: math *is* important. It's especially true here in Alberta, where mathematics plays a key role in oil and gas exploration and development. Mathematical formulas integrated into sophisticated software programs can model conditions at a gas reservoir, refinery, or processing plant, enabling engineers to predict multiple factors including volume, pressure, and temperature.

One of the most significant of these formulas was developed at the University of Alberta in the 1970s by Dr. Donald B. Robinson, a professor in Chemical Engineering from 1948–80, and one of his research associates, Dr. Ding-Yu Peng. The Peng-Robinson Equation of State (EOS) was published in 1976 and is recognized as one of the most successful thermodynamic models for calculating the properties of fluid mixtures.

The Peng-Robinson Equation of State allows engineers to calculate the properties of

hydrocarbon mixtures. For example, engineers tapping into a gas field can use the equation to determine the state and composition of the gas when they bring it to the surface: they will know how much of the gas will be in liquid form and how much of it will be in vapour, and they will know what the liquid and vapour are composed of.

This knowledge affects everything that needs to be done from the moment gas or oil is drawn from the ground to the moment you pull up to the gas pump—everything from sizing pipelines to designing entire refineries.

The model transformed the way engineers conduct routine design calculations, with a shift from tables and nomographs to more sophisticated software used in process simulations. Dr. Fred Otto, a former student, co-professor, Dean of Engineering, and a colleague of Robinson's at both the U of A and the engineering firm DBR & Associates,

says, "The Peng-Robinson Equation of State is used for modelling the properties and behaviour of hydrocarbon gases and liquids. It enables engineers to produce a lot of designs in a very short time frame."

The Peng-Robinson EOS quickly became a standard tool in the design of gas processing plants and enhanced oil recovery systems. It has been incorporated into many commercial software simulation programs used by the gas processing industry.

The development of the Peng-Robinson EOS was the signature triumph for a brilliant researcher and educator, but it is only one of Robinson's many achievements. He began working on gas hydrates in the 1950s, motivated by the needs of the developing gas processing industry in Alberta. A specialist in the area of thermodynamics, Robinson was behind many advances in chemical engineering and gas processing technology while at the U of A and later at DBR &

Drs. Donald Robinson and Ding-Yu Peng made an enduring contribution to their profession and the oil and gas industry through the equation that bears their name.



Photo courtesy Schlumberger DBR Technology Centre

Associates, the technology company he founded in Edmonton.

“Don had many interests and excelled at them all,” says Otto. “In particular, he excelled in his chosen field of chemical engineering as an educator, researcher, businessman, and entrepreneur.”

Robinson was born in Calgary, and raised in B.C.’s Okanagan Valley. He obtained his BSc and MSc in chemical engineering from the University of British Columbia and his PhD from the University of Michigan. His mentor at Michigan was Dr. Donald Katz, a world leader in natural gas and gas processing equipment, and the educator of many technological leaders in this field.

Robinson’s PhD focused on heat transfer, but his time at Michigan kindled a new enthusiasm for phase behaviour. This passion led to the Peng-Robinson EOS.

Robinson’s association with the U of A began in 1948, when he was hired as an assistant professor. He went on to become an associate and full professor, and the head of Chemical and Petroleum Engineering from 1959 to 1970. “Many classes of students recognized his ability to present technical material in an understandable way, and fondly regard him for the quality of his contribution to their education,” says Otto.

Besides teaching thousands of undergrads, Robinson also contributed to the bricks and mortar of the university. He advocated for and

helped design a new building with expanded facilities for Chemical Engineering in the 1960s. During the same decade, he led the formation of the Canadian Society for Chemical Engineering and became deeply involved with the U.S.-based Gas Processing Association (GPA). Both organizations, as well as APEGGA and the Alberta government, gave him awards. The GPA provided one of Robinson’s proudest moments, by awarding him the newly minted Donald L. Katz Award in 1986. (Five other Canadians have subsequently received this award and all were significantly influenced by their association with Robinson.)

In 1970, Robinson stepped down as department chair to focus on teaching and research. He attracted top-flight people from around the world as research associates, and mentored the work of 27 graduate students, many of whom have made their own marks in science, technology, and education. Robinson’s work resulted in the publication of 190 research papers and reports.

Robinson began his own engineering company in 1980, DBR & Associates, to provide technology transfer initiatives based on U of A research work. The company evolved to provide three primary business services: specialized laboratory and research services (with an emphasis on phase behaviour and specialized fluid property measurements), the design and manufacture of high-pressure laboratory equipment and specialty software products, and engineering and technology consulting services.

A 1985 *Edmonton Journal* article on DBR extolled Robinson’s leadership. “Robinson himself is recognized as one of the world’s foremost authorities on the behaviour of oil and gas when it is being produced, transported or processed into petrochemicals.”

Those who knew Robinson as family, friend, teacher, faculty colleague, or businessman also appreciate his personal qualities. As Dr. Otto said in his 1998 eulogy for Robinson, “Life for him was always full to the brim and he loved every minute of it. He treasured his family and had many interests outside of his engineering work. He was admired and respected by all he touched with his genuine interest, bubbly enthusiasm, competence, fairness, professionalism, and wise counsel.”

Robinson remained the president of DBR until 1989, chair of the board until 1993, and a board member until his death in 1998. DBR has now been absorbed into the international conglomerate Schlumberger but retains the core activities and name of its predecessor.

In 2006, the Schlumberger DBR Technology Centre in Edmonton honoured Robinson’s memory with a 30th anniversary celebration of the Peng-Robinson Equation of State.

Now widely used, and cited in more than 2,600 published works, the Peng-Robinson EOS continues to enhance the work of researchers and engineers in the petroleum field world around the globe, as does Robinson’s other research and development work. For example, one of Robinson’s former research associates, Dr. Heng-Joo Ng (MSc Chemical ’71, PhD Chemical ’75), who works at the DBR Centre, is considered a world expert on hydrates, a potential new energy source under investigation in the Mackenzie Delta and other areas of extreme cold.

“Robinson himself is recognized as one of the world’s foremost authorities on the behaviour of oil and gas when it is being produced, transported or processed into petrochemicals.”

—EDMONTON JOURNAL

Robinson’s legacy lives on through the memories of former students, research associates, and faculty who knew him—and through the four scholarships and endowments offered in his name: D. B. Robinson Undergraduate Thermodynamics Prize Fund, D. B. Robinson Research and Environmental Engineering Fund, D. B. Robinson Graduate Chemical Engineering Scholarship, and D.B. Robinson Chemical Engineering Initiatives Endowment Fund. For information on ways to support any of these funds in honour of Dr. Robinson please contact Leanne Nickel at 780.492.4159 or via e-mail at leanne.nickel@ualberta.ca.

(With files from Richard Cairney)



Andrea Collins is an Edmonton-based freelance writer and public relations consultant.

Thank You!

The Faculty of Engineering offers
its thanks for all the gifts great and small by Richard Cairney

In 2004, when the university officially launched Campaign 2008, it expected (in the words of founding president Henry Marshall Tory) that “great things are about to happen.” And the support the Faculty of Engineering received can only be described as transformative.

Out of a staggering \$580 million donated to the university in total, an incredible \$116 million was donated specifically to the Faculty of Engineering.

“It has transformed the intellectual environment with new chairs and professorships, it transformed the physical environment with state-of-the-art equipment and labs, and it transformed the teaching environment

through extracurricular projects and research,” says Dean of Engineering Dr. David Lynch (PhD Chemical ’82).

“We are thankful for the generous support and trust our alumni, friends and partners have shown in us.”

The impact of giving is felt where it matters most—in the classroom.

Nemanja Danilovic expects to complete his PhD in materials engineering this fall. As well as researching solid oxide fuel cells, Danilovic has been learning about teaching.

With the support of the TW Fraser and Shirley Russell Teaching Fellowship, Danilovic is being mentored as a teacher by Dr. John Nychka (Metallurgical ’97), an

assistant professor in the Department of Chemical and Materials Engineering. Danilovic and Nychka share teaching duties for the 190 students in Materials Engineering 202, an introduction to materials science. Nychka teaches the first and last few classes of the semester; Danilovic teaches the rest, including organizing labs.

And from the sounds of it Danilovic is learning as much about teaching as his students are about materials.

“John teaches half the course and I teach half the course, so I don’t get thrown into the fire—I have a mentor to turn to,” says Danilovic.

“John takes the mentorship very seriously,” adds Danilovic. “He comes to all of my lectures and we sit around for a half-hour or an hour talking about what I could have done better, improvements I could have made. We talk about upcoming lectures and we design demonstrations ahead of time.”

Danilovic also sits in on classes Nychka teaches, to pick up different teaching techniques. “It has been an amazing experience,” Danilovic says. “This fellowship lets you teach a course with the safety net of a mentor.”

Students in the class benefit from the fellowship because it puts students first, and their instructor is getting expert advice. Danilovic finds the experience rewarding.

“I get to really experience teaching, to learn what teaching is like and what the workload is like. The best part about it is feeling this joy of teaching and educating students. You get to see students progress through the semester, and in their exams, and in the questions they ask. That’s something I’ve always been curious about.”

Robbie Sharma knows that the classroom isn’t the only place learning takes place. A



Bluefish Studios

Nemanja Danilovic and Dr. John Nychka in a post-lecture analysis. Danilovic is a recipient of the TW Fraser and Shirley Russell Teaching Fellowship, and is being mentored as a teacher by Nychka (Metallurgical Co-op '97).

second-year electrical engineering student, Sharma is a member of the Autonomous Robotic Vehicle Project. The student group is building an underwater robot (affectionately named “Bearacuda” in reference to the Golden Bears) designed to “think” for itself and perform tasks underwater.

At an international competition in San Diego this summer, Bearacuda will run an underwater obstacle course, where it will be required to enter an area through a gate, dock with a buoy, follow a pipeline, drop a marker, detect a beacon and retrieve a payload—all within a set time.

But getting to the competition requires the support of external groups, and Sharma says students and donors alike benefit from gifts to these student projects. Students who participate in the Faculty of Engineering’s student group projects become better engineers and better employees, Sharma says. And companies who donate to these projects may ultimately hire students who have valuable design, teamwork and problem-solving experience in their discipline.

Working in teams provides students with a chance to apply the knowledge they learn in classrooms and labs, and it helps students develop their communication and leadership skills.

“Donors who support these projects are supporting the science and technology outreach programs we run, and they enhance their own identity,” says Sharma. “And as students, we are flourishing.”

While students benefit from the generosity of alumni and friends of the Faculty, they are also among the Faculty’s most important benefactors, having collectively pledged nearly \$2 million since 1994 to support teaching and learning.

In 1995 the Engineering Students’ Society saw a way of helping the Faculty financially, and established the Engineering Undergraduate Equipment Fund after a vote of Engineering students. Through the fund, Engineering students contribute \$25 per term to help maintain and upgrade lab equipment. The cumulative effect is impressive. With approximately 3,800 undergraduate students enrolled this year, the fee raised an impressive \$190,000 during the fall and spring terms alone.

“It’s easy to see that if everyone contributes just a little bit, it makes a big differ-

ence,” says Daryl Tran, a fourth-year electrical engineering student and president of the ESS. “This money goes to enriching the student experience, to enhancing the academic quality of the program, so I am totally fine with paying that extra money.”

Giving, it seems, begets giving. Saeid Amiri, a graduate student from Iran who is researching hydrogen fuel cells, understands the personal aspect of giving. A recipient of the Captain Thomas Farrell Greenhalgh Memorial Scholarship in Chemical Engineering, Amiri says the scholarship stands out.

“This one feels personal,” says Amiri. “It isn’t from an institution, it comes from a person. It makes you think that one day, it is the kind of thing you might want to do as well.”

In many cases, gifts do trigger a sort of cascade of giving. The cumulative effect of one small gift, says Lynch, can be enormous.

“The multiplication of support from generous donors that attracts further support from government bodies, foundations, research organizations and others literally turn an initial donation into one several times larger—and without that initial donation, the other support wouldn’t have come,” says Lynch.

As an example, Lynch cites growth in the number of entrance scholarships the Faculty offers. “A large number of modest donations we received from our alumni cumulatively became a significant resource, and it was possible to use that resource in discussion with other groups and multiply that amount until today we have more than \$1 million in scholarships and entrance awards available to new students every year.

“So what can be seen as a modest gift of \$20 or \$50 or \$100 has become a \$1-million per year scholarship program.”

Another instance of building a gift comes in the recent establishment of the Ron Nolan-Hatch Chair program in Sustainable Energy and Mineral Process Technologies. Funded by Hatch Ltd. and its former CEO Ron Nolan (Electrical ’60), the professorship will help educate a new generation of engineers in sustainable technologies.

“It’s a way of giving back to an institution that had a part in any success I might have had,” says Nolan. “Students benefit because of the future demand for this expertise, and because they are doing something for the

world and the future. Industry will benefit by having engineers with this expertise available to them.”

Lynch says the Faculty is poised to solidify its position as one of North America’s top engineering schools and adds that, while the campaign has ended, the Faculty’s plans remain ambitious. Meeting new goals requires support for students, teachers and research.

Specifically, the Faculty has plans for a new facility designed for faculty and staff, so that existing buildings can be used as efficiently as possible, in the service of students and researchers. Alumni, visitors and other guests will have a single location to go to when visiting the Faculty, “and we can reclaim space in the existing buildings and convert it into teaching and research labs and student spaces,” says Lynch.

“We are thankful for the generous support and trust our alumni, friends and partners have shown in us.”
—Dean David Lynch

For a cause like that, the Faculty can turn to its own students, according to ESS president Tran. “This is a part of the service that ESS provides. We were the ones who came to the Faculty in the ’90s and said, ‘We know the economic situation is terrible; maybe this will help.’ Our relationship with the Faculty is interconnected. We have to work well with each other and pull in the same direction to achieve something great.

“And there is an unwritten rule or fact that members of the ESS executive, when they become alumni, are something like four times more likely to give back to the Faculty,” Tran adds. “Students who feel they have gotten something more than an education, who had a very positive experience, are the ones who feel it is OK to give back.”

DR. FRANZ VITOVEC

1921 - 2009

Franz was born in Vienna, Austria, on June 7, 1921, and passed away on February 10, 2009, in Victoria, B.C. Franz is survived by Elfriede, his wife of 67 years, sons Heinz (Powell River, B.C.) and Ernst (Fresno, California), and grandsons Karl and Thomas.

Franz's youth was happy despite the severe austerity caused by the First World War and the Depression. His father had built a house in the suburbs of Vienna to escape from their two-room basement apartment in the city. It was here that Franz developed his strong work ethic and love for music.

Franz obtained a degree in Mechanical Engineering at the Junior Engineering College in Vienna, and this became very influential for his survival during the Second World War. Franz met his future wife, Elfriede Waldhausl, in 1939 at a dance organized by the Red Cross. They were married in 1942. Following the war, Franz took a job teaching mathematics at the Junior Engineering College and studied at the University of Vienna where he took a Doctor of Technical Sciences degree. Franz worked at the Experiment Station of the University of Vienna, published numerous scientific papers,

and was appointed "Private Docent in Material Sciences" by the university.

In 1952, Franz accepted a position as assistant professor at the University of Minnesota in Minneapolis, and Franz, Elfriede, and their two young sons moved to North America. Although Franz was soon promoted to associate professor, he welcomed the opportunity to further develop his skills as a scientist, researcher, and educator and accepted a position as Professor of Metallurgical and Nuclear Engineering at the University of Wisconsin in Madison in 1958. Franz always claimed that the years in Madison were the happiest of his life. In 1965, Franz and family moved to Edmonton, Alberta, when he was appointed Chair of the Department of Mineral Engineering at the University of Alberta.

Franz's contributions to scientific literature were considerable, and his research led to 83 major publications amongst numerous other articles. He maintained contact with many of the graduate students he mentored, and his contributions will long be remembered as his enthusiasm for discovery was infectious. In his late years Franz was honoured by receiving the

Golden Engineering and the Golden Doctors Diploma from his University in Vienna.

Although Franz officially retired in 1986, he remained extremely active. He and Elfriede retired to the Saanich Peninsula in British Columbia. Franz's love of research inspired him to conduct genealogical research into his ancestry. The document he produced, which traces the Vitovec family history back to 12th Century knights in Southern Bohemia, can be found in Salt Lake City at the Genealogical Institute and at the National Library in Ottawa.

In his retirement years, Franz was able to rekindle his interest in the Arts that was initially inspired by his parents in his youth. He kept up his mental activity by attending many Elderhostels where he and Elfriede could select topics of their interest such as ancient history, religions of the world, and art. Franz was attending an Elderhostel in San Francisco when he became ill and was hospitalized in January 2009. He returned by air ambulance to Canada on February 9th and died the following day. Throughout his life, his family took first place in his thoughts and actions.

in memoriam

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

Ajayi-Obe, Folake Bolanle
(MSc Computer Process Control '02)
Anstruther, Robert William
(Chemical '76)
Balko, Peter Nicholas (Civil '60)
Barton, Jim (Electrical '46)
Bick, Roland Walter (Mining '49)
Bishop, Albert Allen (Electrical '49)
Brown, R Clive (Chemical '43)
Burgess, James (Civil '58)
Chinneck, Macrae (Mining '52)
Cotterill, Melvin James
(Electrical '50)
Crosby, Russell Kneen (Civil '63)
Cullen, Gerry (Chemical '49)
Decker, Robert Michael
(MSc Petroleum '86)

Dixon, Thomas W (Chemical '39)
Fulton, John (Jack) (Mining '39)
Glowa, Paul Julius (Chemical '41)
Gray, Robert John (Chemical '46)
Howard, S Grant (Electrical '56)
King, Egerton Warren
(Electrical '43, LLD [Hon] '88)
Koty, Michael Albert
(Mechanical '77)
Lee, John Cong Ng (Civil '72)
McLean, Patrick Blair
(Petroleum '91)
Neelands, Hamilton Howse
(Electrical '48)
Pelletier, Robert Eugene
(Mining '49)
Pool, Marie A. (Civil '61)

Rama, William (Chemical '56)
Rogers, Harry Frederick
(Electrical '49)
Schultz, Wayne Lindsey (Civil '79)
Seneshen, Dr. Maurice Julian
(Chemical '53)
Sim, Lawrence Gregory (Civil '73)
Stevinson, Harry Thompson
(Electrical '44)
Stroud, Earl Louis (Electrical '50)
Taylor, Ronald Keith (Chemical '59)
Van Fossen, Edward John
(Chemical '08)
Willis, Ernest G (Electrical '35)
Worobec, William Daniel
(Mechanical '66)

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

Horte, Vern L (Chemical '49)
Osberg, Gustaf Lawrence
(Chemical '39)
Pawliuk, Alec (Electrical '49)
Probert, James Francis
(Electrical '50)
Rabusic, Frank (Chemical '50)
Ripley, Charles Farrar (Civil '44)
Spankie, John Allan
(Mechanical '64)



CHEN, TONGWEN**PEng**

Has been named a Fellow of the Engineering Institute of Canada. A professor in the Department of Electrical and Computer Engineering, Chen's research contributions lie mainly in computer and network based control systems, including sampled-data control, multirate systems, process control, networked control systems, and their applications to industrial problems.

HARDY, DARREN**(Chemical '89) PEng**

Has been appointed vice president, operations, of Canadian Oil Sands Trust, effective September 2, 2008. Previously, he was with Syncrude Canada Ltd.

HANI HENEIN**PEng**

Chemical and Materials Engineering professor Hani Henein, director of the Advanced Materials and Processing Laboratory, has been appointed to the board of directors of the Minerals, Metals & Materials Society.

HETTIARATCHI, PATRICK**(PhD Civil '86) PEng**

Has won the Shell/ASTech Outstanding Achievement in Environmental Technology and

Innovation Award. Hettiaratchi has designed a revolutionary landfill 'biocell' that can help control climate change by reducing methane emissions and create energy from waste.

KING, WILLIAM**(Chemical '75)**

Has been appointed as vice president, major projects, with OPTI Canada Inc. King joined OPTI in 2004 and brings over 25 years of experience on international onshore and offshore gas and pipeline construction projects in the oil and gas industry.

KVISLE, HAL**(Civil '75) PEng**

Has earned the University of Alberta School of Business 2009 Canadian Business Leader Award.

Kvisle is president and CEO of TransCanada Corporation, a leading North American energy infrastructure company ranking in the top 500 publicly traded companies worldwide.

MASLIYAH, JACOB**PEng OC**

Has won the ASTech award for Outstanding Leadership in Alberta Technology.

A professor emeritus in the Department of Chemical and Materials Engineering, Masliyah made ground-breaking discoveries about the interaction of bitumen with solids and water.

MARKIN, ALLAN**(Chemical '68, LLD [Hon] '02) PEng**

Has been inducted as a Member of the Alberta Order of Excellence for his considerable service in the oil and gas industry and his great support of Alberta hospitals, post-secondary schools and social service initiatives. Markin currently serves as chairman of the board for Canadian Natural Resources Limited.

MARSDEN, RANDY**(Electrical '89) PEng**

Has won the ASTech Societal Impact Award for his contributions to assistive technology (see story page 14).

The president and CEO of Madentec Limited, Marsden has developed numerous technologies that have significantly improved the lives of disabled persons.

OLEKSHY, ANTONY**(Electrical '77)**

Has won the AVAC/iCORE/ASTech Outstanding Achievement in Information and Communications Technology and Innovation with his long-time collaborator H. James Hoover, of the U of A Department of Computing Science. The two are founders of Avra Software Lab Inc., a U of A spinoff company.

PETHER, DONALD**(Metallurgical '70)**

Has been appointed to the Board of Directors of Emera Inc., an energy and services company with \$4.7 billion in assets. Prior to his position as Chair, Pether was the President and Chief Executive Officer of Dofasco Inc.

TANG, TIAN

An assistant professor in the Department of Mechanical Engineering, Tian has been selected to receive this year's Adhesion Society's Outstanding Young Adhesion Scientist Award, sponsored by the Adhesive and Sealant Council Inc.

RUSSELL, T.W. FRASER**(Chemical '56, MSc Chemical '58)**

Has been selected to receive the Lifetime Achievement in Chemical Engineering Pedagogical Scholarship Award from the American Society for Engineering Education (ASEE). Russell has established the T.W. Fraser and Shirley Russell Teaching Fellowship in the Faculty of Engineering. He is the Allan P. Colburn Professor of Chemical Engineering at the University of Delaware.

XU, WILSON**PEng**

Has been named a Fellow of the Engineering Institute of Canada. Xu is a professor in the Department of Electrical and Computer Engineering, holding the NSERC/iCORE Alberta Power Companies Industrial Research Chair in Power Quality.

ZHAO, VICKY

An assistant professor with the Department of Electrical and Computer Engineering, Zhao

has been awarded the IEEE Young Author Best Paper Award. The award honours the author of an especially meritorious paper dealing with a subject related to the society's technical scope. Recipients are under the age of 30.

H O N O R E D

METZNER, ARTHUR**(Chemical '48)**

The Society of Rheology has established a prestigious award for young rheologists in the name of the late Arthur B. Metzner, H. Fletcher Brown Professor Emeritus of Chemical Engineering at the University of Delaware at the time of his death in 2006. Metzner earned his doctorate from the Massachusetts Institute of Technology. He joined the University of Delaware faculty in 1953. He was elected to the National Academy of Engineering in 1979 and was recently named to the American Institute of Chemical Engineers' list of 100 Chemical Engineers of the Modern Era.

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University of Alberta ENGINEERING

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Mechanical Engineering Professor Doug Dale wanted to ease the financial strain on future Engineering students. One of the things he has done is made a charitable bequest to the Faculty of Engineering.

If you would like more information on how you can support future U of A Engineers through a planned gift, please contact:

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Planned Giving Officer, Faculty of Engineering, University of Alberta
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