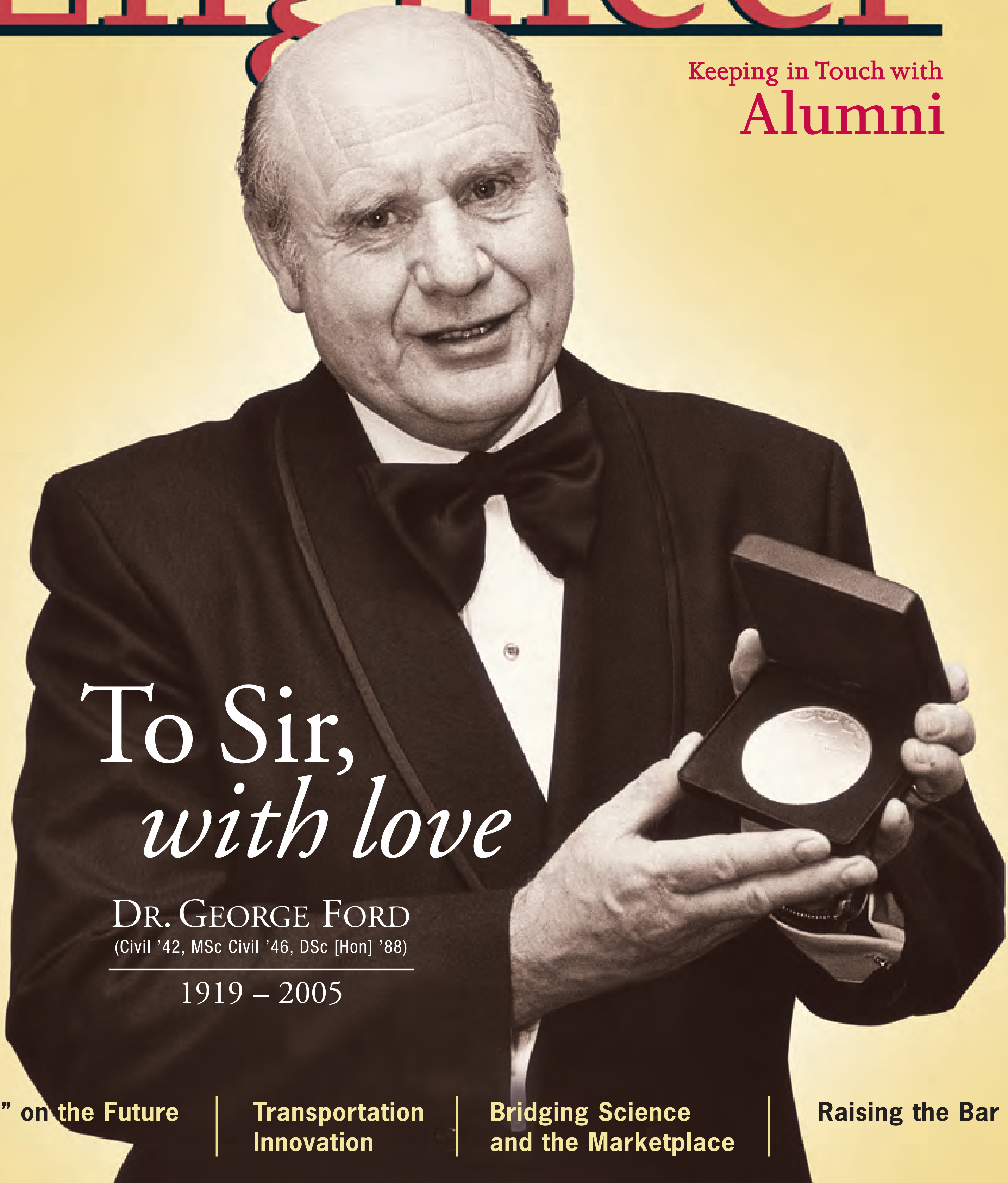
U of A Engineer

Keeping in Touch with
Alumni



To Sir, *with love*

DR. GEORGE FORD
(Civil '42, MSc Civil '46, DSc [Hon] '88)

1919 – 2005

An "I" on the Future | **Transportation Innovation** | **Bridging Science and the Marketplace** | **Raising the Bar**

Greetings from the Assistant Dean

Our job in the Faculty of Engineering's External Relations Office is to maintain relationships with our alumni long past their day of graduation. We do this by keeping our alumni up to date with what's happening within the Faculty and by encouraging them to become involved in various aspects of the Faculty's work. Knowing how busy we all are, we realize your effort at ongoing contact and interaction reflects much more than your pride in being a U of A Engineer. It also shows a deep appreciation for your academic past and an understanding of being part of something greater. Engineers have a strong tradition of expressing professional pride, and this spirit continually inspires us to find new and better ways of maintaining our relationships with you and offering opportunities for you to maintain ties to your former classmates and current colleagues.

The highlight of the year will be Engineering Reunion 2005, held September 29 through October 2 on the University of Alberta campus. If you have not yet registered, visit www.ualberta.ca/alumni as you still have time to do so. Whether you are celebrating a "special" reunion year (that is, an anniversary that is a multiple of five) or something in between, you are welcome to attend the many Engineering-specific and campus-wide events that are scheduled. More details are listed on pages 30 and 31 of this issue. Engineering alumni make up 25 percent of all university alumni attending reunion events each year, so we know your participation is vital to the success of this event.

With the assistance of our local alumni hosts, we will continue holding our annual Engineering alumni receptions in more cities than any other faculty. I encourage you to watch your mailbox or check out our Engineering events calendar (www.engineering.ualberta.ca/events.cfm) for dates of receptions near you.

If you are unable to attend Reunion 2005 or one of our alumni receptions, please stay in touch with your Faculty and your classmates by e-mailing engineer.alum@ualberta.ca with updates on your career, address, and family.

The growth of the Faculty of Engineering over the past 90 years, and particularly in the last decade, would not be possible without the advocacy and support of our alumni. You play a key role in our university, your profession, and your communities. My staff and I appreciate each opportunity to meet you, work with you, and respond to your needs as alumni.

David M. Petis
Assistant Dean, External Affairs

Faculty of ENGINEERING
University of Alberta

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.*

UofA Engineer
Fall 2005 Issue 18

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Faculty of ENGINEERING
University of Alberta

Message from the Editor

A special feature of this issue is a tribute to Dr. George Ford (Civil ’42, MSc Civil ’46, DSc [Hon] ’88), the beloved former Dean of the Faculty who passed away on May 26, 2005. Many alumni and collegues have contacted me with poignant and sentimental words of remembrance. The outpouring of praise and respect has been emotional for many.

I hope you enjoy the tribute to Dr. Ford and all the other stories in the fall issue of the magazine. Feedback is always welcome. Contact me at 780.492.4514 or at sherrell.steele@ualberta.ca.

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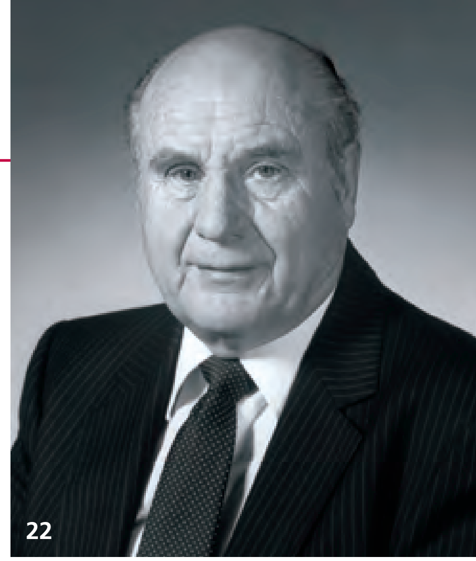

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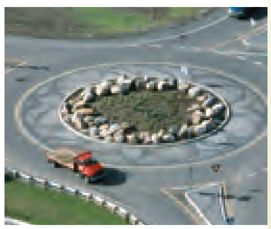

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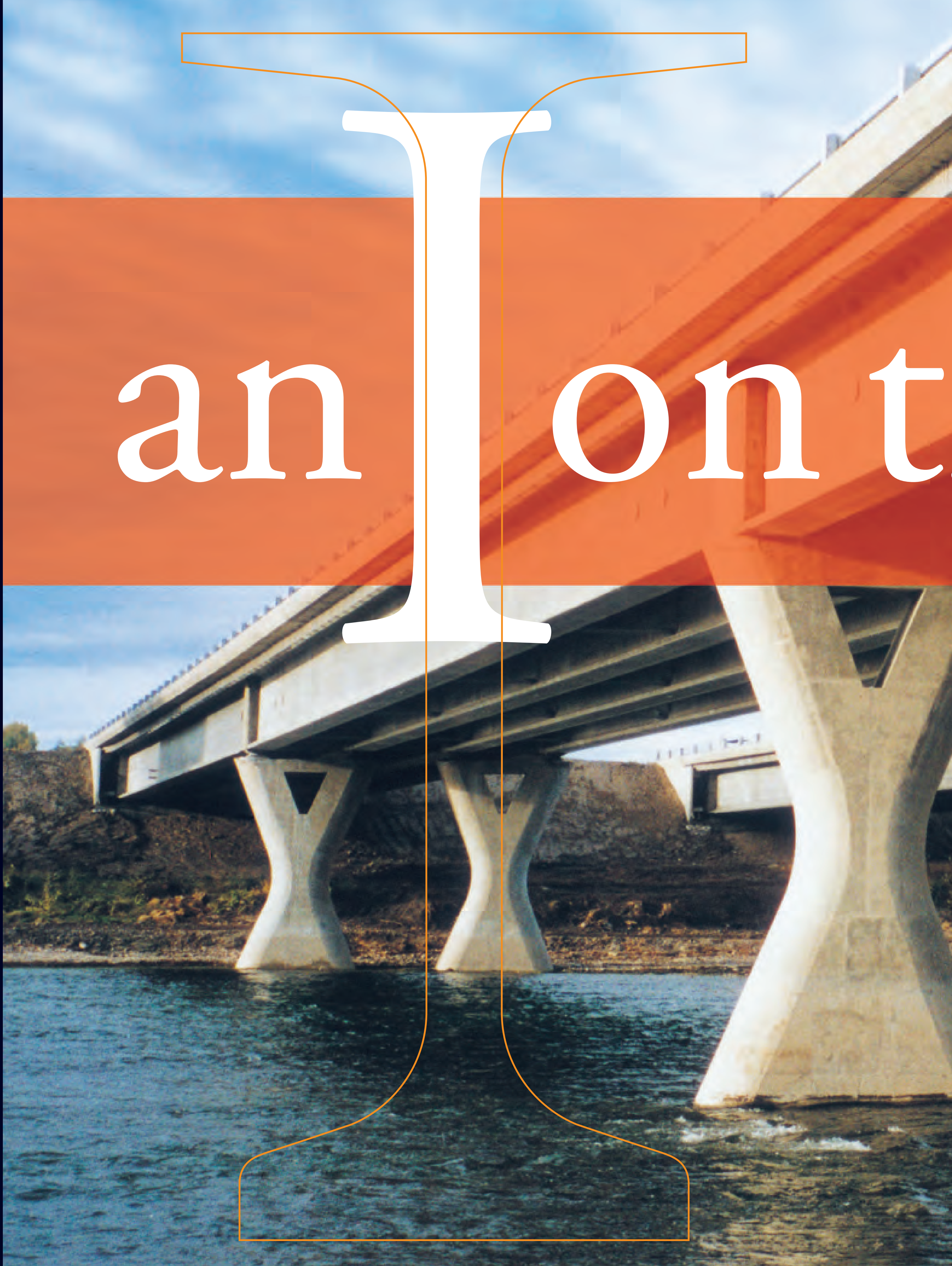
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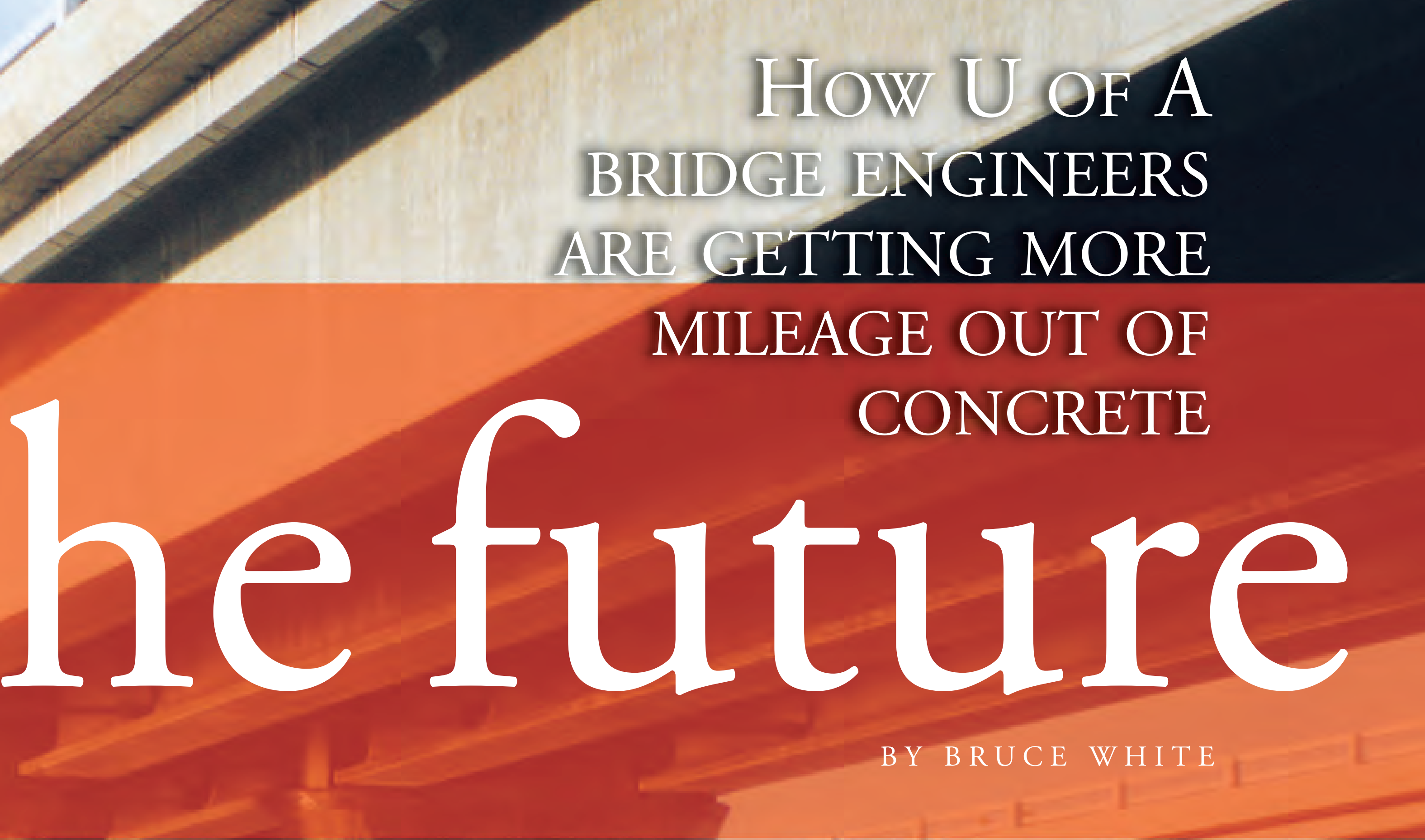


How U of A bridge engineers are getting more mileage out of concrete

he future

BY BRUCE WHITE

In engineering there are big advantages to using the local terrain instead of fighting it.

Let's take the business of building highway bridges in Alberta as an example. Consider the extremes of weather. Also consider a commodity economy that needs to move heavy loads by road. There are long distances. There are also two urban metropolises with more than a million people each. There are issues surrounding labour supply, materials, logistics, and cost.

So how would an engineer design a bridge to take into account some of Alberta's unique geography?

One word: concrete.

In the past few years, Alberta has become a world leader in the use of pre-stressed, precast concrete girders to build mid-length highway bridges. We design and build some of North America's longest and most efficient concrete bridges at costs up to 19 percent less than competing steel designs. And U of A engineers are instrumental in making this happen.

Abdul Waheed (MEng Structural '71) and Raymond Yu (MEng Structural '83) are bridge engineers in the Technical Standards Branch of Alberta Transportation. Waheed is a fabrication standards specialist, while Yu holds up the structural standards end. Working together, along with consulting engineers and the precast concrete industry, they've adapted concrete for use in places it has never been before.

Pre-stressed, precast concrete bridges aren't particularly new; they have been in use on Alberta highways since the 1950s. But for five decades, their use was limited to shorter spans, while steel continued to handle the heavy lifting in the bridge world. By the mid-1980s, concrete

Top left : Construction of Bow River bridge for Deerfoot Trail extension south of Calgary

Below: NU girders in a precast concrete plant

Lower left: A NU girder in transit

bulb-T girders were limited to maximum spans of 42 metres.

"We were finding bulb-T to be severely restricted," says Larry Hancock, project developer for bridges at Con-Force Structures Ltd. of Calgary (a manufacturer of pre-stressed, precast concrete products). "Bridges were limited in span, needed frequent supports, and didn't have the section capacities."

Clearly, something better was needed. In the mid-1990s, that something was rolled out in Nebraska, a midwest state with similar terrain to Alberta.

Dr. Maher K. Tadros is a world expert in building bridges with concrete. He is best known for developing the Nebraska University (NU) girder bridge design.

His technology uses very large pre-stressed, precast concrete I-girders to replace steel girders and bulb-T designs. Consider a standard highway bridge that is 12.4 metres wide with two lanes of traffic and shoulders. The bridge deck normally rests on 10 bulb-T girders that are supported by piers every 40 metres or less. Four large NU I-girders can do the work of 10 bulb-Ts.

Dr. Tadros's NU girders, though bulkier and heavier, are also stronger than bulb-Ts. That means longer spans of concrete with fewer piers and no temporary supports. This translates into less scaffolding to be put up and taken down, less disruption of rivers and streams, less risk of injury for construction workers, and less cost.

The NU girders also can be fabricated in a factory—where quality control is high—and trucked to a site. They are already being produced at two locations within the state.

The NU girder technology clearly had potential for Alberta, especially since the province produces a lot of concrete and very little steel. So in 1999, Waheed paid a visit to Dr. Tadros in Omaha, along with Hancock and Associated Engineering Ltd.'s Bala Balakrishnan (PhD Structural '86).

After their site visits and plant tours, Waheed returned to Alberta convinced that Alberta Transport could super-size the Nebraska design. A limiting factor in the American version, however, was a 41-tonne weight limit in effect on Nebraska roads. Alberta's robust resource highways can carry nearly twice as much weight. That means bridges have to be stronger, but it also makes it possible to truck much heavier sections to a site.

Con-Force developed forms for a heftier Alberta version of the NU girder. At 2.8 metres deep and up to 65 metres long, it had the longest span and the heaviest load-bearing strength of any concrete girder used in North America.

The technology looked promising enough, but Alberta Transportation didn't want to take a wholesale leap into the unknown. As a trial project, they chose a proposed replacement bridge across the Oldman River on Highway 864 north of Taber. First, they asked contractors bidding for the work to submit two proposals: one for a concrete I-girder design and the other for a conventional steel design.

The concrete design spanned 301 metres with seven sections of girder ranging from 20 to 57.5 metres in length, but requiring only four permanent piers and another four temporary supports that would be taken down after construction. The concrete version came in at $5.7 million, 19 percent less than the steel version (a difference of $1.2 million). And this was in 2001, long before steel prices shot up to the stratosphere.

Not only was the Oldman Bridge a bargain, but it also gave the engineers an opportunity to refine the technology. One concern centred on the bundles of post-tensioned steel cables that are pulled through draped horizontal ducts, running the length of the bridge inside the girders, to help support the structure. The engineers drilled viewing holes into the duct so they could measure the movement of the bundles and thus gain a better understanding of the friction involved. The new technology passed its tests with flying colours.

The next trial project was bigger—twin 236-metre bridges designed to take the Deerfoot Trail Freeway across the Bow River south of Calgary.

Again, the concrete design cost less than the steel option (in this case $9.3 million versus $9.7 million), so Alberta Transportation decided to build the Bow bridges with NU girders. The work was completed in 2003, and the bridges opened to traffic in 2004.

With their clean lines and rounded X-shaped piers, the Bow River bridges are almost elegant in appearance, at least to some observers. "I guess beauty is in the eye of the beholder," Balakrishnan says with a chuckle.

Balakrishnan, who had been Associated Engineering's principal engineer for the Bow River bridges, soon found a third place for the concrete girders—the soon-to-open southwest leg of Edmonton's Anthony Henday Drive (See "Ring Around Edmonton," *U of A Engineer*, Winter 2005).

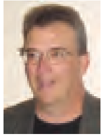
The project originally included a single span over Wedgewood Creek placed atop 20-metre-high reinforced earth walls. Balakrishnan put forward a value-engineering proposal to replace this with three spans of NU girders totalling 135 metres. His plan saved taxpayers half a million dollars while also minimizing the ecological impact on the creek ravine.

Waheed and Yu clearly love to build bridges, and Alberta offers them plenty of opportunities to ply their trade. The province is in the midst of a huge highway-building program, including most of the Canadian portion of a new Mexico-to-Alaska trade route. That project involves the twinning of Highways 2 and 43 for 1,039 kilometres from the Alberta-U.S. border at Coutts to west of Grande Prairie. Billion-dollar ring-road bypasses are also being built around Calgary and Edmonton, and highway upgrades are planned for the oil sands in the northeast.

Steel still rules on longer spans, but concrete I-girders are catching on like a prairie wildfire. Eleven NU-style bridges are currently under construction across Alberta, with four or five more in the design stages. Without even considering the recent spike in steel prices, the savings will add up to tens of millions of dollars.

Concrete-girder bridges also fit well with Alberta Transportation's approach to building, which Waheed describes as "get in, get out, stay out." They have lower maintenance costs and a longer life cycle—75 or perhaps 100 years, compared to 60 years with the previous technology.

Alberta's innovative version of the NU girder came at the right time—and has proven perfect for the terrain.



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

2005 Minister's Award of Excellence

A team of specialist engineers from Alberta Infrastructure & Transportation, A. D. Williams Engineering Inc., Associated Engineering, and Con-Force Structures won the 2005 Minister's Award of Excellence in Technical Innovation with the development of the NU girders. The 2005 Minister's Awards celebrate excellence in technical and process innovation focusing on roads and bridges.

How Alberta's monster I-girders are made

Concrete I-girders for the pioneering Oldman River and Bow River bridges were made in Calgary by Con-Force Structures Ltd. The girders were trucked to the sites and hoisted into place for post-tensioning before the road decks were installed.

A girder, which looks in cross-section like a stout capital "I", is gigantic: up to 2.8 metres high and 65 metres long. For normal spans and similar depth, four of these carry the same load as 10 of the previous bulb-T concrete girders.

Each girder is cast by pouring high-performance concrete in a gigantic steel form. The concrete is further strengthened and reinforced in three ways:

- Welded-wire fabric mesh is arranged to create a reinforcement cage inside the form. The fabric does the same job as rebar, but is stronger.
- Steel pre-tensioning strands are installed lengthwise in the girder bulb (the foot of the structure) and stretched out with jacks. In some cases, pre-tensioning strands are also installed in the flange at the top of the girder for stability during shipping.
- As many as four corrugated-metal ducts are installed in the main body of the I. These run the length of the girders and are draped to sag in the middle, like a wire between telephone poles. These ducts accommodate woven wire post-tensioning strands that run the length of the bridge. These wire strands are installed after the girders are hoisted into place and are tensioned on site with jacks at the abutments at each end of the bridge.

It takes about 12 hours after pouring for the concrete to gain sufficient strength to have the side forms removed and another 12 hours to set up the forms for the next pour. In other words, these giant girders are produced at a rate of one per day.

transportation inn

ovation

by Joan Marie Galat

Civil engineers are inventive designers and planners who occasionally leave astonishing legacies in their professional wakes. Some of the earliest to set their imprints designed the ancient pyramids, Roman aqueducts, and Persian windmills.

Doran Clark Photography

In Canada, engineers are responsible for the Rideau Canal, the world's first aluminum bridge in Arvida, Quebec, and Hibernia, the oil platform off Newfoundland's east coast.

Engineering advances have moved the country from a vast wilderness to a place where industry and civilization have expanded coast to coast. Shipping and hauling forever changed with the transcontinental railway and again with the Trans-Canada Highway.

Today, you can experience a modern engineering accomplishment by veering off the Trans-Canada north from Edmonton. Take Fort McMurray's Highway 63, and you will see the result of a $22 million project, spearheaded by Paul Bassi (Civil '86).

Bassi is employed by Earth Tech Canada Inc. as vice president, Western Canada District. His three-year enterprise on the Highway 63 and King Street Interchange began in 2000, when Alberta Infrastructure and Transportation appointed Earth Tech to find a solution to a traffic problem in one of Canada's fastest growing industrial communities.

The Highway 63 and King Street Interchange in Fort McMurray presented a multi-layered challenge. It involved high traffic volumes as well as close proximity to another intersection parallel to the highway. The route additionally frustrated drivers by forcing them to manoeuvre without the assistance of traffic signals. Safety was compromised daily for the 7,000 city drivers on King Street and the 20,000 Highway 63 drivers in an area where trucks, that engulf the highway's entire width, commonly haul oil-industry structures.

The high traffic volumes caused numerous collisions and conflicting turning movements between Highway 63 and King Street. Between 1994 and 1998, a total of 40 collisions occurred at the intersection with two fatalities.

The roadway's location in a valley bordering the Hangingstone River meant that environmental dynamics were a prominent issue. Two existing bridges also had to be considered. Earth Tech was tasked with functional planning, detailed design, tender documents preparation, and construction administration of the interchange.

Bassi's role was to find technical solutions that would move traffic quickly, safely, and without confusion through this problem-fraught zone. Bassi tackled the staggering number of challenges by heading a team including Thurber Engineering Ltd., Westworth Associates Environmental Ltd., Schwabenbauer & Associates Ltd., and Hyroad Surveys.

"We looked at several alternatives in the functional planning stage, including trumpet- and diamond-shaped interchanges," says Bassi. "But we were not able to address the issues of high environmental impact on Hangingstone River. We also had to consider safety issues relating to traffic operations as well as high construction cost."

Conventional interchange designs would not work with the location, so Bassi and his team started looking at the more modern roundabout interchanges being built in the United States and the United Kingdom.

Roundabouts have proven their advantages in Europe for several years and are being increasingly built in the United States. The Institute of Transportation Engineers (ITE) in the U.S. considers the roundabout the safest form of intersection. The challenge in Canada was to come up with an innovative idea and prove that it was feasible.

"I still remember the very first picture I saw. (It) looked like it would work well at this particular site," says Bassi. "It was a photo of an interchange built in the U.K. with roundabouts at each end of the highway bridge."

New guidelines in American and United Kingdom publications proved timely. Because roundabouts were increasing in popularity, the U.S. Department of Transportation, Federal Highway Administration, issued a publication in June 2000 called "Roundabouts: An Informational Guide."

The Highway 63 and King Street Interchange won the 2005 Overall Award of Excellence in Transportation Innovation from the Minister of Alberta Infrastructure and Transportation.

Bassi's team referenced this guide, which encompasses all aspects of building a roundabout, from planning, policy concerns, and operations, to design, safety, and landscaping. They then developed design elements specific to the needs of the Highway 63 and King Street Modern Roundabout Interchange.

The plan involved designing a single lane roundabout that would prevent confusion for drivers. "We applied this concept to our project because it worked well with the types of (physical) constraints we had," says Bassi.

Roundabouts have a number of positive characteristics, including the ability to handle higher traffic volumes. This improved capacity translates into fewer delays for drivers. Less stopping means less idling, which benefits the environment by reducing both air and noise pollution. To ensure the least amount of environmental impact, it was vital to leave the original site as intact as possible. The roundabout design enabled Earth Tech to keep the roadways close together, preventing them from encroaching on Lion's Park nearby.

Costs were reduced by $5 million by narrowing the highway bridge from three lanes to two, instead of rebuilding. This resulted in less earthwork than would have been normally needed and also reduced the impact on Lion's Park.

Still, being convinced something will work is not enough to get a project off the ground. Traffic circles are not common in Alberta, and Earth Tech was sensitive to the fact that the public would need to be educated on the benefits of the roundabout concept.

Earth Tech managed public consultation and visualization by conducting an open house in April 2001. This provided residents with an opportunity to learn about the project and to express their concerns. Earth Tech created and presented a computer-animated simulation of traffic flow and a three-dimensional traffic model of the roundabout along with detailed drawings and graphics.

"We thought the roundabout was the optimal plan and recommended it as the best choice," says Bassi. "When you walk people through all those favourable characteristics to show that it's safer, operates better, and has lower costs, why wouldn't they want this interchange?"

Although Fort McMurray's City Council unanimously supported the design, the difference between a traffic circle and a roundabout had to be explained.

"Traffic circles are designed to be approached at higher speeds, and the slope of the pavement in the circle subtly encourages faster movement than in a roundabout," says Bassi. In a roundabout, however, drivers must slow down to enter traffic.

"You want them at the same speed," says Bassi. "The roundabout is designed in such a way that the pavement is sloped down and out from the center. This angle of slope, combined with deflecting traffic to the right as one enters the roundabout, encourages lower speeds and improves the likelihood of having drivers travel at an appropriate slower speed."

Thompson Bros. (Construction) Ltd. started construction in August 2001, with the interchange opening to traffic in 2003. It's been an exhilarating period for this U of A alumnus.

"You don't really envision what lies ahead when you're a student," says Bassi. "This roundabout is a new design. It's the first one in Canada, and the first time a roundabout has been tied in with an interchange. I was fortunate to see this from the start, through design and construction, to the finish. It was quite a treat, quite exciting actually. And now Ontario, Quebec, and B.C. are considering using roundabout interchanges."

The innovative solutions of Bassi's team were achieved with such precise ingenuity that only careful observers will realize the beauty of this endeavour by the subtle way it achieves so much. Traffic volume has increased from 20,000 to 30,000 vehicles per day on Highway 63 in the vicinity of the interchange. Traffic on King Street has increased from 7,000 to 14,000 vehicles per day.

"If I go back to my university days, it all comes down to the thought process you use to analyze a problem and the ability to look at different solutions without having a bias," says Bassi.

"I've got quite an interesting job today."

Joan Marie Galat is a Stony Plain writer and the author of the Dot to Dot in the Sky *astronomy books.*

roundabout timetable

- design completed in winter 2000
- tendered in spring 2001
- construction began in summer 2001
- interchange opened to traffic in summer 2003

roundabout rationale

The roundabout interchange solution was recommended because:

- it has the highest safety qualities
- its capacity maintains free-flow traffic
- delays are typically reduced to 3 seconds, from 13
- less impact on Lion's Park
- less fill was required, which reduced earthwork costs
- it had a reduced structural cost based on:
  - — widening the existing bridge instead of building a new one
  - — incorporating a two-way instead of a three-lane highway bridge
  - — increasing weaving distance from 250 m to 550 m

The Highway 63 and King Street roundabout.

Doran Clark Photography

bridging basic and the m

John McDougall
(Civil '67)

Vision, risk taking, problem solving, business acumen—it's all in the blood for **JOHN R. MCDOUGALL** (Civil '67), president and CEO of Alberta Research Council. BY ANDREA COLLINS

science arketplace

John's great-grandfather, trader and businessman John A. McDougall, was instrumental in Edmonton's early development. He and his wife Louisa were the town's 39th and 40th official citizens.

John R. is just as firmly rooted in Edmonton, but his frontiers are international, both literally and virtually. So is his expertise: innovation.

Since his 1997 appointment as head of Alberta Research Council (ARC), the largest research council in Canada, McDougall has engineered a major paradigm shift for the organization. He turned the 80-plus-year-old Council from a government-funded, government-centric agency into a nationally-recognized, market-driven, innovation juggernaut, serving 900 local and international industry clients a year and garnering more than $80 million in annual revenue.

"It wasn't me," he protests. "My ability to get things done is dependent on others. I see my role as showing people possibilities and exciting them about making those ideas real."

This yen to look at the possibilities led McDougall to engineering in the first place. "I did not have a strong desire to do engineering work," he says, "but I did want to get into business. At that time, most companies were headed by engineers. I had been exposed to the profession since childhood through my father John F. McDougall (Civil '30), so it seemed a natural fit and a good means to an end."

McDougall found the school's combination of business and technical information to be a solid grounding for the future. "We learned how to frame a problem, how to solve it. We combined knowledge of technical elements with business processes."

McDougall chose his discipline, Civil Engineering, for a reason many young people follow: "I went Civil because it had the professors who resonated for me and because most of my closest friends went there."

"Things were very different in those days," says McDougall. "Our classes were small and intimate, especially once you chose your discipline. We all took the same classes at the same time, we studied together, we socialized together—it was more a fraternal than an academic setting. I remain close to my classmates to this day."

Alberta Research Council

Some examples of innovative projects begun during McDougall's tenure at ARC are:

Bottom left: ARC worked with Highmark Renewables/Highland Feeders, one of Canada's largest feedlot operations, to develop the Integrated Manure Utilization System (IMUS)—a technology that transforms manure into green electricity, heat, organic fertilizers, and reusable water, while reducing greenhouse gas emissions and other environmental impacts;

Top: ARC experiments that simulate high pressure reservoir conditions validated a new steam assisted gravity drainage (SAGD) process that combines solvents with steam. The patented process is expected to increase oil production by 19 percent over conventional SAGD while using half as much water and recovering 85 percent of the solvent with the oil; and

Page 15: Canadian makers of oriented strand board have realized cost reductions of approximately $192 million since 1997 through collaborative research and technology improvements by ARC and Forintek, Canada's wood products research institute.

With his degree in hand, McDougall promptly accepted a job as a petroleum engineer and went to work for ESSO for the next 10 years. While there, he was one of the earlier industry people to examine and reduce the industry's environmental impact.

McDougall's interest in the environment had been sparked by another engineer at ESSO, Alec Hemstock. Hemstock presented a wholistic view of the world that was only beginning to emerge at the time. McDougall subsequently took several environmental engineering post-grad courses, which he applied to his work in oil and gas, subsequent work in business, and in the current work of ARC.

McDougall left the oil and gas field in the 1970s to join the family business, McDougall and Secord, which specializes in real estate, development, and investment (founded by his great-grandfather in 1879, the business still operates in Edmonton).

However, an established business didn't offer enough challenge for the young engineer. Although he remains titular head of McDougall and Secord to this day (his wife Irene operates the company with 15 family members as shareholders), he opened his own consulting company, Dalcor Innoventures Ltd., within a few years.

Dalcor served as an agent for large projects taking place in Alberta and around the world. (They specialized in projects larger than $100 million, equivalent to $500 million today.) The company looked after research, proposals, regulatory approvals, public and stakeholder relations, management, and construction. Their clients came from such diverse fields as offshore oil, transportation, ports, pipelines, synthetic materials, and coal.

"We were able to provide the companies with the information and services they needed, while at the same time learning a lot about different businesses," says McDougall. "I am a big believer in continuous education and learning, and it's always best when you are able to both give and get that knowledge."

In the early '80s, the National Energy Program led to a downturn in the energy sector, and Alberta took a direct hit in the recession that followed. Downsizing by government and other sectors led to a second recession in the early '90s.

"It seemed like Edmonton was in the doldrums for a long time," says McDougall. "The optimism was gone. The industry changed in other ways too: control moved to the financial institutions and insurance companies. There were fewer opportunities for innovation, less satisfaction in the work."

It was at this time of restlessness that McDougall was approached to take a position as the Ernest E. and Gertrude Poole Chair in Management for Engineers at the U of A. He continued to operate his business (though management was largely in the hands of others) while serving as Chair from 1991 to 1997.

"I got some real positives there and found I enjoyed teaching. In trying to provide information and inspiration about innovation to others, I had to understand it myself, so it was a richly rewarding time of introspection and exploration for me as well as my students."

By this time, McDougall's career had spanned 30 years, and he was considering slowing down into a lifestyle of semi-retirement. Then along came the opportunity at Alberta Research Council in 1997, and he was off and running again.

"I may have seemed an odd choice as president of a research council," he reflects. "I wasn't a researcher, had never been, and I didn't have a PhD. But ARC needed to change, and the board was looking for someone from a different culture. I knew the organization because I had been on the board, but I also had a solid grounding in both technology and business and extensive industry connections."

Challenge accepted, McDougall found he had inherited a depressed and demoralized

Alberta Research Council

organization. Government cutbacks had halved the staff and funding and projects had slowed to a trickle. "Up to that time, government contracts had formed the bulk of the business, and the well had run dry. It was like a university without students."

Undaunted, McDougall set about making the organization not only financially viable, but vibrant with new life and new vision. Rather than operating as an adjunct of government or university or industry, Alberta Research Council became an organization whose work complements all three.

In radio interviews for Innovation Alberta, McDougall called ARC "a bridge between basic science and the marketplace." Describing how it works, he said: "…the discovery side, which universities do very well, attracts these very creative, independent thinkers, and they're an excellent source of ideas… Industry, on the other hand, is looking to ensure that what they do is cost effective, and it meets the quality standards, and it's done in a timely way…

"What that typically means is that the discovery activity tends to operate in a 10- to 20-year-plus horizon… before those ideas can typically convert into practical applications… Industry wants a horizon that's maybe two years, perhaps three, but certainly not much more than that…

"Our job [is to] look at industry and be driven by the marketplace, but be able to be smart enough to anticipate what their


Alberta Research Council

needs are in a market sense, and then have the scientific wherewithal to mine the discovery places for those ideas."

The formula is working. ARC revenue comes increasingly from contract work, as opposed to grants and government support, and staff is back up to 500 people. Though the economic development of Alberta is and always has been the mandate for ARC, that does not mean its activity has to be entirely centred here. Presently, 53 percent of ARC's industry projects are Alberta based, 24 percent in other parts of Canada, and 23 percent in other countries.

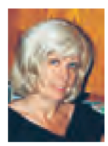
ARC's activities focus on two primary areas: energy and life sciences (human and animal health, crop development, genomics, and biotechnology)—each with a solid underpinning of environmental stewardship, value chain development, and IT integration.

"By taking out the things we were doing small scale, or not doing well, and focusing on our core expertise, we've been able to meet the demands of industry-scale projects," says McDougall. "We are able to identify industry needs, often before they do, and start on innovative ways to meet them."

The work takes patience ("We're not out to make home runs," says McDougall), but progress is steady and incremental. Today, Alberta Research Council is the Canadian giant in its field, and McDougall hopes to lead it in several new directions: more work with smaller companies to help build the supply chain, continued growth in technology and communication, and more multi-disciplinary, cross-sector work.

Like his great-grandfather, McDougall is always focused on the next frontier. He's helping to develop a proposed Innovation Canada project to unite provincial and territorial research councils, thus creating a virtual national centre for innovation.

"I have never been interested in work that is steady and runs itself," he concludes. "You need to be passionate and prepared; make sure what you do is future-driven."



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

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The

C. W. (Bill) Carry

C.W. Carry Chair
Strong as Steel

BY CONNIE BRYSON

You could call it the gift that keeps on giving. In 1994, the Carry family of Edmonton made a generous gift to the University of Alberta in honour of the family patriarch C.W. (Bill) Carry. At the time, the endowment for the C.W. Carry Chair in Steel Structures—$2 million—was the largest donation the University had ever received.

But the legacy of the gift represents more than its monetary value. Fast forward 11 years and you can see the impact—an unbeatable reputation for high-quality undergraduate and graduate education in steel structures, Canada's largest university research group in steel structures, and research results from this group used in the Canadian Steel Structures Design Standard as well as design codes and specifications in many other countries.

"The biggest impact of the Carry Chair is that it ensures that the University of Alberta will maintain its reputation for excellence in research and education in steel structures," says Dr. Roger Cheng, current holder of the Carry Chair and head of the Civil and Environmental Engineering Department.

"People might think that since steel structures is a well-established area, maintaining the area should not be an issue. The reality is that priorities shift over time and important things can be put on the back burner. Having the Chair means this won't happen."

Bill Carry's son Roger thinks that his father would have wanted his name associated with excellence. "My father was a very good engineer. He was a great innovator and did a lot for steel construction in Canada. He would have been surprised by the gift, but he would have been proud. So would my mother."

Bill Carry was born in Winnipeg in 1905. He graduated in Civil Engineering from the University of Manitoba in 1926 and went to work for Dominion Bridge Company. He was transferred to Calgary and then to Edmonton after a subsidiary of Dominion Bridge, Standard Iron Works, suffered a major fire. It was Bill Carry's job to design and construct a new plant.

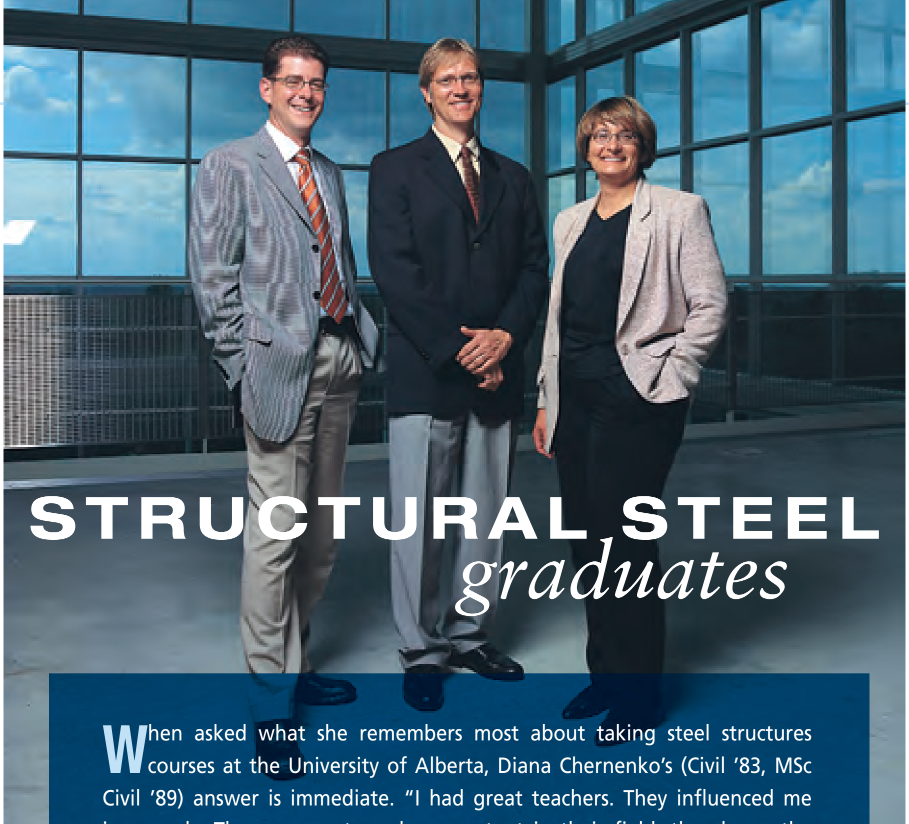
A dispute over his pension caused Carry to resign from Standard Iron in 1945. Encouraged by his wife Muriel, he set up his own company: C.W. Carry Ltd. Although the company's first job was cleaning used oil drums from Norman Wells, C.W. Carry Ltd. quickly became known for steel fabrication.

The years immediately after World War II were pioneering days in the steel-construction industry. Fabricators and the subtrades carried almost all of the design responsibilities without the benefit of significant input from consulting engineers.

Many of Alberta's landmark structures are a result of Bill Carry's know-how and his company's construction skills: defense-related work at Namao, Greisbach, and Cold Lake; work at the Great Canadian Oil Sands and Syncrude plants at Fort McMurray; the Scotford oil refinery; the Redwater petrochemical plants; and the Diashowa and Alpac forest product plants in northern Alberta. In Edmonton, the downtown skyline reflects the work of C.W. Carry, including the Milner Building, Oxford Tower, and Manulife Place.

> Growing up in Winnipeg, Bill Carry shared a paper route with the late R.M. (Bob) Hardy (LLD [Hon] '77) who was Dean of the Faculty of Engineering from 1946-1959 and from 1963-1971. The two paper-boys became lifelong friends.

In 1958, C.W. Carry Ltd. was sold to Canada Iron Foundries (Canron). Bill Carry remained with the company as vice president until 1967 when he started a small steel business with his son Roger, a chartered accountant. In 1971, C.W. Carry (1967) Ltd. purchased the assets of the old company from Canron. Roger led the rebuilding of the company, and C.W. Carry Ltd. is once again a leader in the steel-fabrication business. Bill Carry passed away in 1992.



STRUCTURAL STEEL *graduates*

(left to right): Diana Chernenko (Civil '83, MSc Civil '89), Dr. Jeff DiBattista (MSc Civil '95, PhD Civil '00), and Greg Miazga (Civil '83, MSc Civil '86)

When asked what she remembers most about taking steel structures courses at the University of Alberta, Diana Chernenko's (Civil '83, MSc Civil '89) answer is immediate. "I had great teachers. They influenced me immensely. They were extremely competent in their field; they knew the practical aspects and could communicate well. I learned about constructability issues, the logical application of models. These areas aren't taught in most other places. As a result, U of A grads have a jump on other people." She notes that the U of A's Dr. Laurie Kennedy is one of the most frequently referenced authors in the Structural Steel Standard. "This shows the depth of influence he has had in the industry."

Chernenko is now a consulting engineer at Edmonton-based A. D. Williams Inc. "I still apply the stuff I learned," she says. "My engineering education is one of the reasons I've been successful in my career."

Dr. Jeff DiBattista (MSc Civil '95, PhD Civil '00) credits the great professors he had at the U of A for inspiring him to keep a hand in teaching. In addition to his job as a structural engineer with Cohos Evamy in Edmonton, he has taught Civil Engineering 270 (which covers the fundamentals of structural engineering) two times in the past four years. "I caught the 'teaching bug' when I was doing my PhD," he explains. "Professors like Geoff Kulak and Laurie Kennedy (professors emeriti) were able to breathe such life into their subjects. You couldn't help but be interested."

DiBattista received the very first C. W. Carry Award in Steel Structures in 1995 while working on his Master's degree. "Graduate students often have a hard time putting enough food on the table, so that scholarship was very important to me," he notes. DiBattista maintains his connections with the steel structures group at the U of A. "There's been a change of guard now with the retirement of Professors Kulak and Kennedy. While the faces have changed, the quality remains. The current faculty, especially Professors Bob Driver (Civil '83, MSc Civil '87, PhD Civil '97) and Gilbert Grondin (PhD Civil '91), have helped me out enormously."

Greg Miazga (Civil '83, MSc Civil '86) found there were few jobs after graduation in 1983. "Basically there were no jobs—you had to take whatever you could find. I had been so inspired by my structural steel courses, I decided to return for my graduate degree." After 10 years in consulting, including the engineering work on several projects for C. W. Carry Ltd., Miazga landed a job with Waiward Steel Fabricators Ltd. He has been with the company for eight years and is now manager of engineering.

"I've done design work using many materials—concrete, wood, precast concrete. Now I'm focused on steel. This is what I like to do the most."

"I wanted to do something that would carry on my father's name, something that would be linked to his pioneering work in steel structures," says Roger Carry. That idea was mulled over with family friend Dr. Geoff Kulak (Civil '58), a Civil Engineering professor at the U of A and an international authority on steel structures. Dr. Kulak was named as the first holder of the Carry Chair.

Dr. Kulak recalls, "When Roger and I began to discuss this, we recognized that we had an opportunity to do something significant—that we could do more than just pay someone's salary."

Indeed they did. To maximize the use of funds, the University used the income from the endowment to fund a junior faculty position while keeping Dr. Kulak's position. Dr. Gilbert Grondin (PhD Civil '91) was hired in 1995.

The tradition of maximizing the use of funds continues. When Dr. Kulak retired and Dr. Cheng took over the Carry Chair position, Dr. Robert Driver (Civil '83, MSc Civil '87, PhD Civil '97) was hired. The hiring of junior faculty has left more funds available to support undergraduate and graduate scholarships and prizes for design projects.

"This is an important area because it allows us to attract high-quality students," explains Dr. Kulak. "Because of the Carry Chair, we can make competitive offers to graduate students. This is absolutely essential to maintaining our reputation in steel structures research."

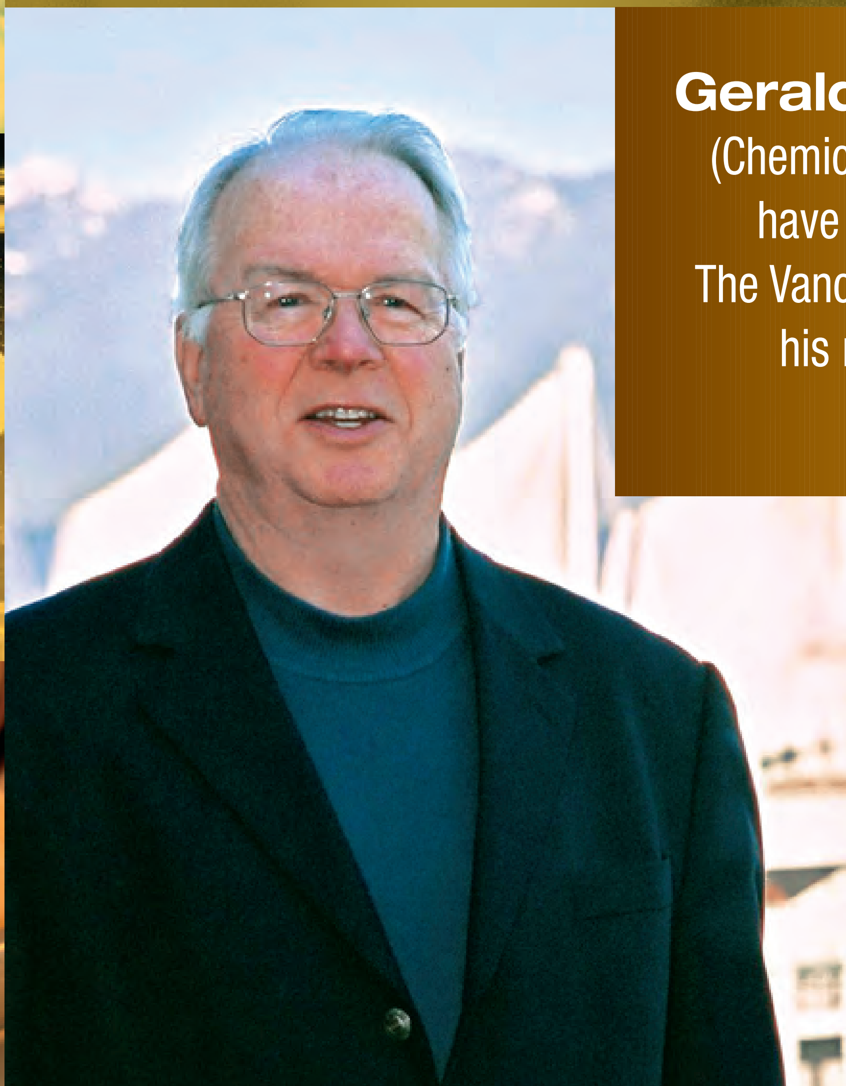
"It all comes down to excellence," says Dr. Cheng. "You don't have excellence without stability. The Carry Chair ensures the viability of our steel structures group. It benefits industry by supplying skilled graduates and providing new knowledge from research. This is the legacy of the Carry Chair."

Connie Bryson is a Edmonton-based freelance journalist.

Raising the BAR

by Phoebe Dey

Gerald (Gerry) Oyen (Chemical '59) says he doesn't have much of a story to tell. The Vancouver law firm bearing his name as senior partner suggests otherwise.



Gerald Oyen
(Chemical '59)

Upon graduation, Oyen immediately landed a job with Dow Chemical Canada Inc. at its head office in Sarnia, Ontario. Working in the technical service department, he offered solutions for customer queries and problems and visited Dow clients in cities throughout Canada and the United States.

When he first started with Dow, he dealt with workhorse chemicals like chlorine and caustic soda, which were considered "the bottom of the pile back then." Oyen laughs, "I was assigned to do something no one else wanted to do."

Within a few months, however, Oyen shifted to the "new" field of flexible and rigid polyurethane foams—a burgeoning and innovative product that was replacing latex foam and residential insulation at the time. Oyen quips that for a short time he held the unofficial title of Canada's leading expert in polyurethane foams.

But that wasn't enough for Oyen. After a four-month hiatus in Europe, he returned to Dow, this time in development sales. He kept thinking, however, that because Dow employed so many chemical engineers, it might take too long to climb Dow's corporate ladder. He speculated on other ways to fast-track his way to the top.

Considering either an MBA or a law degree, Oyen noticed that Dow had an in-house lawyer who sat in on important meetings and was part of the decision-making process with top executives. He liked the flexibility a law degree provides and decided to pursue a law degree with the objective of getting back into the corporate world.

Oyen's chemical engineering background has given him a leg up in the (intellectual property) field, a particulary challenging area of law considering the technical aspect of his files.

Oyen had an old friend who had gone into patent law and recommended it as a career. That was enough for him. He studied law at Toronto's Osgoode Hall, where he earned the highest mark in his class on patents, trademarks, and copyrights. This set the stage for a distinguished career in intellectual property law.

After graduating from law school and then spending seven years working six-day weeks in an Ottawa firm, Oyen teamed up with a lawyer from another firm to launch their own intellectual property law firm in the nation's capital. Five years later, they opened a second office in Vancouver.

When problems surfaced in the Vancouver operation, Oyen headed west for a year to turn things around. Twenty-five years later, he's still there, and the firm—Oyen Wiggs Green & Mutala LLP—is western Canada's largest intellectual property law firm.

How things have changed. When Oyen first started in patent law, there was no such thing as computer software, silicone chips, or even a name for the large industry that would soon be known as biotechnology.

"They had barely cracked the DNA molecule at that time. I spent a lot of my time at the beginning working on what are now considered old-fashioned drugs such as cortisone and penicillin."

Over the years, Oyen's caseload grew to include files from major companies and universities. An intellectual property lawyer has to keep up with developments, so over his years of practice, Oyen's knowledge of the chemical and medical industry expanded to include new wonder drugs such as potent antibiotics, diazepam, amphetamines, Alzheimer drugs, and cardiovascular agents.

He also dealt with new ceramics, plastics, insect pheromones, and polypeptides. His case history reads like a list of engineering departments—the numerous patent applications he has drafted have related to inventions in the chemical, mechanical, and electrical fields.

Oyen's chemical engineering background has given him a leg up in the field, a particularly challenging area of law considering the technical aspect of his files. The nature of patent law has turned Oyen into a quasi-expert in many different areas.

"You learn to pick the inventors' brains and get a condensed education on many different subjects. Having a chemical background enables me to converse knowledgably with scientists in order to prepare a patent application for the particular technology involved."

One case that stands out for Oyen, mostly because of its sheer commercial size, was obtaining the Canadian patent for aspartame in the 1970s. "It got to be so big that the company investing in the product started a subsidiary company strictly to manage aspartame."

For Oyen, new technology continues to make his work interesting. A current file is pending for a group of university inventors who are working on drug-infused ceramic-coated stents—small, expandable tubes that help open blocked arteries and veins in the body.

"The body rejects anything foreign, so these researchers are trying to disguise the stents so they are less foreign. Various forms of ceramics are already in our teeth and bones, so the body won't reject these as it would other materials."

For many years, Oyen taught sessions on basic patent law at UBC Law School and made presentations to researchers at the Engineering Faculty. In the old days, Oyen says, inventors were given a grace period in which to file patent applications in cases where they "fumbled and let the invention out of the bag." Today, the laws no longer forgive those slips.

"It's a tricky situation because now in most cases in order to apply for protection abroad, the inventor has to keep the invention strictly confidential. But with the existing 'publish or perish' doctrine at most universities, before you know it, the inventor has told someone, usually colleagues, what they've done. One of the main themes I preached was to make sure you keep it to yourself and see your patent lawyer first."

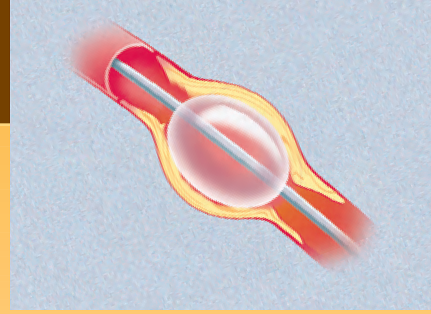
Oyen remembers a situation a number of years ago when a bright university researcher discovered some new drugs that appeared to inhibit the onset of dementia in elderly people. Before filing any patent applications, he naively visited an eastern-based subsidiary of a large U.S. drug company and disclosed his research findings to them. His hope was that they would find his research interesting enough to license his technology or fund further research. The drug company rejected his proposal.

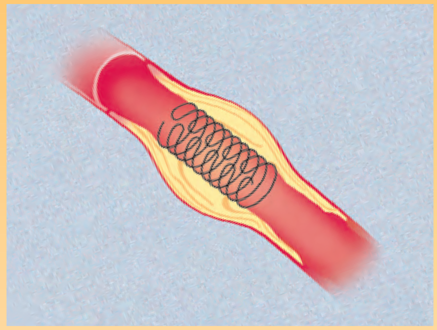
Canadian patent applications are opened to public inspection a year and a half after the filing date. About 18 months after his initial visit, the university researcher found out that the same eastern drug company had filed for patent protection on a very closely related group of drugs. Because the company got on record first, its pending application greatly reduced the scope of protection that the university researcher was able to get for his group of drugs.

Oyen himself has published a number of papers in national and international journals. A decade into his law career, he wrote a comprehensive paper on how to claim chemical and pharmaceutical inventions; it was widely used by practitioners across Canada. He has also written a paper on the subject "The Researcher and Intellectual Property" which has been distributed to inventors at various universities in Canada. Because of his work and reputation, Oyen has been invited to present papers at conferences across Canada, the U.S., and New Zealand.

Oyen is a past member of the Joint Liaison Committee and a past chair of the Unauthorized Practice Committee of the Intellectual Property Institute of Canada. The latter committee is responsible for policing unauthorized professional practice and advertising in the intellectual property community.

It all adds up to an impressive life story, and Oyen isn't about to stop adding new chapters. His firm, boasting 15 expert lawyers and 35 support staff, is well poised to take on future challenges.



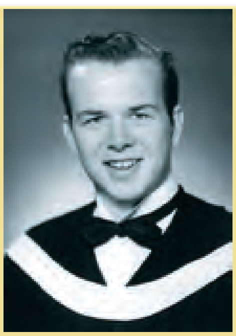


Oyen's current patent file includes drug-infused ceramic-coated stents.
Top: An artery which has collapsed or clogged is being inflated by a balloon.
Bottom: An artery with a stent inserted in the collapsed configuration and then expanded to keep the affected area of the artery open.

Phoebe Day is an Edmonton-based freelance writer.

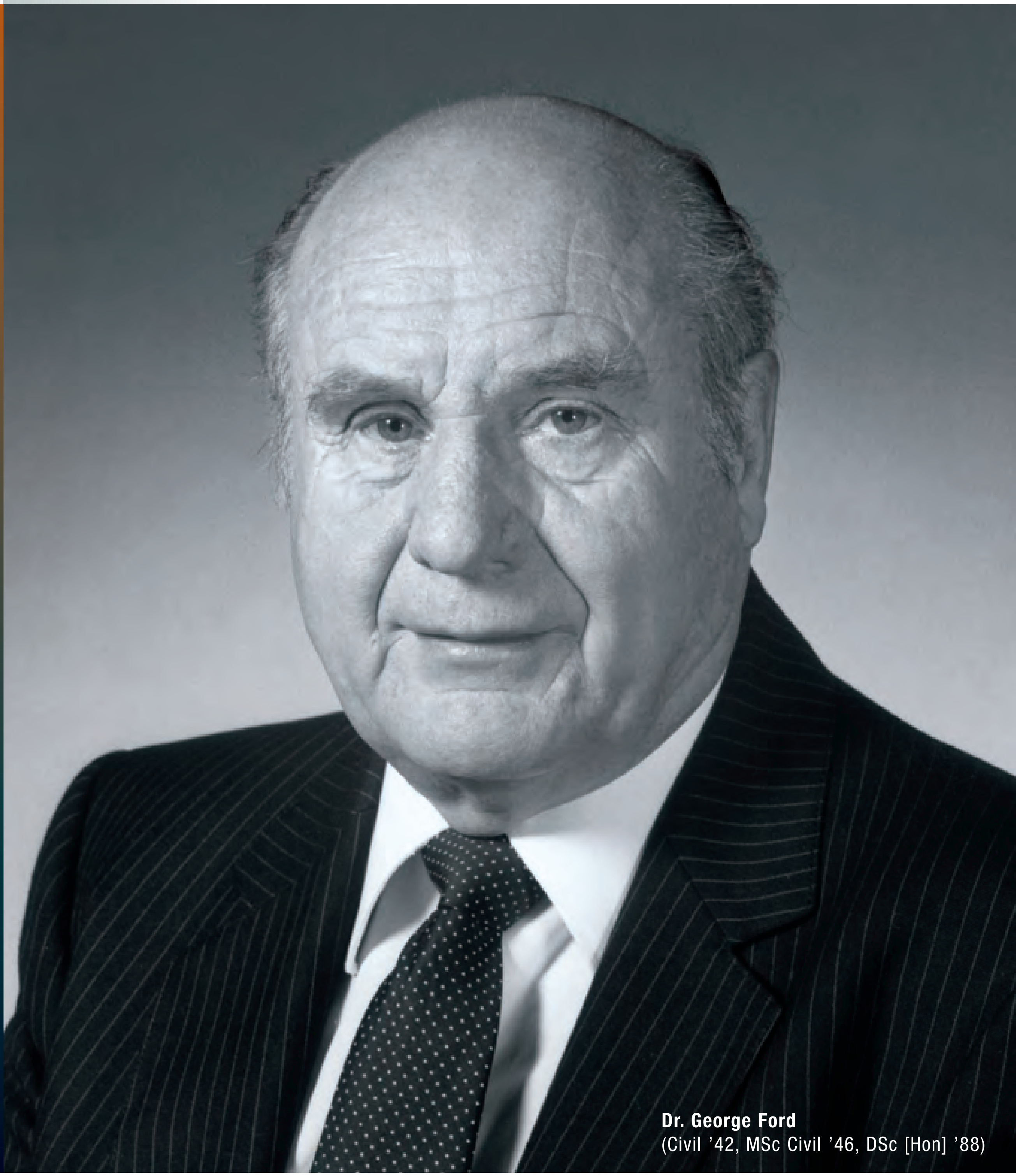
KAPPA SIGMA FRATERNITY

Established 1869



A significant influence and source of support in Oyen's life while he was attending Engineering at the U of A was provided by his involvement in the Kappa Sigma Fraternity. Oyen could rely on his fraternity brothers for support in his studies. The various Kappa Sigma functions were also a big part of his social life. Unlike certain later periods when fraternities fell out of favour, fraternities in the late 50s had large memberships and were a major player on campus. Members of the various fraternities were active participants in all facets of intramural functions including sports, songfest, Gateway newspaper writing and publication, Evergreen and Gold yearbook preparation, and various campus societies that contributed to a vibrant and active campus life. Through his involvement in the Kappa Sigma Fraternity, Oyen developed strong friendships with a number of his fraternity brothers, and those friendships continue to this day. In recent years, fraternities have been making a comeback on campus, and Oyen wholeheartedly supports that development because he believes that fraternities provide a lot of support to a person while attending university.

EDITOR'S NOTE: In 2001, Dr. George Ford suffered a stroke that left him incapacitated physically. He remained actively involved in professional engineering associations and the University, including writing historical articles for *U of A Engineer*, despite increasing physical weakness. Dr. Ford died on May 26, 2005, before this article could be published. His work through the Faculty of Engineering spans more than 60 years. Here we focus on Dr. Ford's first love and commitment: teaching and mentoring. In the next issue, we look at Dr. Ford's contributions as a leader at the U of A and in the engineering profession.



Dr. George Ford
(Civil '42, MSc Civil '46, DSc [Hon] '88)

To Sir, with love

by Susan Beach

DR. GEORGE FORD
1919 – 2005

Only one man at U of A Engineering taught undergraduate engineers every year for 40 years. One man knew and remembered every student and staff member who passed through the Faculty, and kept track of where they went and what they did. And every year, when they returned to their alma mater, alumni from all departments asked first for news of one man: Dr. George Ford (Civil ’42, MSc Civil ’46, DSc [Hon] ’88).

Teaching and mentoring were Dr. Ford’s specialties, as much as brittle fractures, and focused his life work: inspiring undergrads, building up the Faculty, and setting higher standards for the profession of engineering. Former Dean Fred Otto (Chemical ’57, MSc Chemical ’59) speaks for many: “George Ford was a very special instructor at the university. I don’t think that anyone who ever had him would forget the excitement and the competence that he brought to the classroom and the laboratories. He excelled as a teacher, and he [had] an amazing mind—it makes you envious.”

Even when he started out as a tall, skinny lecturer, Ford’s presence in a room commanded attention. In later life, he grew into a big bear of a man and could seem stern and intimidating, especially if he turned to bark at you. But from your answer—defiant, honest, eager, or timid—he gleaned who he was talking to, and like a sailor, knew what tack he’d take to reach you. He turned any passing conversation into questions, a challenge, food for thought—always teaching.

Most alumni remember taking his first year course. “I met George Ford on my first day in engineering in 1959,” says former department chair Dr. Gary Faulkner (Mechanical ’63, MSc Mechanical ’66). “Several speakers in a large auditorium were introducing us to the Faculty. George Ford was the only one who didn’t need sound equipment to be heard, and he was very convincing about what to go into.”

Professor Eldon Fowler (Civil ’48, MSc Civil ’50) is sure that “students [from the war] years remember their first lecture with George, warning us about the tough course ahead. ‘I want you to shake hands with the student on your left,’ Ford would say. ‘Now shake hands with the student on your right. Only one of you will be here after Christmas.’”

As a professor, Dr. Ford told great stories, asked keen questions, shared his quick wit and intellectual curiosity, and always appreciated a good joke. He was a critical thinker, trusting his own observations (armed with knowledge) over any authority. He backed up his assertions by modelling critical inquiry, continually challenging his own assumptions, and daring students to outdo his own drive for knowledge.

By the late ’50s, Dr. Ford knew he was already the “old guard,” so he listened to and learned from each year’s new classes.

Throughout it all, he never lost the capacity to imagine himself sitting in the class as a student.

From 1942–85, Dr. Ford called upon the Faculty to put the needs of undergraduates first by giving them the best teaching available. Although he was eager as anyone to expand the Faculty's equipment and space, Dr. Ford argued that undergraduates are the foundation of a strong faculty.

As a student, he'd had access to the best teachers and engineers of his day, and he wanted that tradition to continue. So, as head of Mechanical Engineering in the '60s, Dr. Ford taught two first-year courses as well as a third- and a fourth-year course. Even as Dean, Dr. Ford continued to teach an introductory course every year.

"And keep in mind that he did all his own marking," adds his daughter Elizabeth. "In the large classes especially; it was the only way he could get to know every student."

But Dr. Ford did not merely teach students; he called them to the profession of engineering. Dr. Ford inspired, intimidated, entertained, and challenged students to find and share the best in themselves as engineers. Faulkner adds, "George embodies what a good engineer is: technical ability but also integrity, honesty… Those are the values we want to bring out in engineers."

Since he knew the students, Dr. Ford never hesitated to intervene between classes. Muriel Cheriton (Electrical '46), former student, long-time colleague, and neighbour says, "You talk with some of his former students and they all credit George with the fact that they carried on. He seemed to understand students who were having trouble and encourage them where needed. But when it was a case that he had to challenge them, he did. I've heard that he's come up to [a student] and said, 'You might as well quit right now 'cause you'll never make it.' And of course that's all they needed to think, 'I'll show that S.O.B.!'"

Dr. Ford demanded the highest of standards, but he also understood that people don't get everything right the first time. Fowler was Associate Dean of Student Services when Dr. Ford was Dean (1971–76) and remembers often discussing regulations of student performance at Faculty Council.

After one long meeting, Dr. Ford told Fowler, "It's up to Faculty Council to make regulations, and it's up to us to break them when it's necessary." Recently, Fowler heard of "a grad in Hong Kong who has made a multi-million dollar donation to U of A Engineering; he was one of [our] students who didn't meet the regulations and was given a second chance."

(back row, left to right) Dr. Fred Otto (Chemical '57, MSc Chemical '59), Hon. Tom Siddon (Mechanical '63), (front row, left to right) Dr. Don Stanley (Civil '40, DSc [Hon] '88), Dr. Egerton King (Electrical '43, DSc [Hon] '88), and Dr. Ford on the occasion of the 75th anniversary of the Faculty of Engineering.

Left: Dr. A. M. M. Safiullah, director of the Directorate of Continuing Education, Bangladesh University of Engineering and Technology (BUET) and Dr. Ford on site in Bangladesh. Dr. Ford was project advisor on the linkage project between U of A and BUET.

Dr. Ford's passion for teaching led naturally to mentoring. Many alumni name Dr. Ford as the one who saw a gleam in their eye or heard the hope when they mentioned a particular kind of research or began to look for work. He used his connections at the National Research Council and across North America to match students with opportunities to see what they could do.

Faulkner says, "George Ford gave me an opportunity that changed my life… [he] asked me to teach a class during my Master's. I started in Elementary Mechanics… I loved it and wanted to do more. I did my PhD, I was hired back, and I've been at U of A from 1969 to now."

Since Dr. Ford had been mentored "by the best" in his time, he wanted to pass on that experience, in the tough, good-humoured way he'd experienced, to as many young engineers as he could. In doing so, he embodied the best he'd received from each of the men who had mentored him.

Professor I.F. (Ikey) Morrison was Dr. Ford's favourite teacher, both inspiring and knowledgeable. "He could grab your imagination and you just loved it… If your design came out different from your guess, you

Put it in a black box

Dr. Ford borrowed the black box concept from physics and adapted it to teach fresh engineering students how to tackle the overwhelming theories and problems in engineering. He used to say, "Any problem you are doing, put it in a black box. If it knows it's in a black box, then everything's ok. If it doesn't know it's there, start over. Whatever you are thinking about, view it in a black box, and then it's workable. If it doesn't know it's in there, you are going to have trouble." Isolating the problem gave new engineering students a practical focus on what they did know and could do. At the beginning of term, Dr. Ford would introduce a problem and discuss how to solve it. With every new lesson, he would return to the original problem from a new angle, posing new questions and solutions. Dr. Ford explained, "I don't think you could be a good engineer and work on solutions until you know the heart and soul of the problem. Getting to know what the problem is, that in itself will help you solve the problem."

did it over again because the guess was as good as the design."

This discipline paid off when there was no "chain long enough to measure across" the Liard River on the Alaska Highway. Dr. Ford made three calculations "all within a quarter of an inch." The foreman from the American Bridge Company didn't believe him and brought up a thousand-foot chain from New York to measure the hard way. Dr. Ford "was in luck—within an eighth of an inch!"

Dr. Ford also appreciated seasoned engineers like Art Walker, chief engineer on the Liard project, who gave generously of his time and experience. "'What have they got you doing?' [he asked me.] I said, 'Just about anything, surveying and that.' He said, 'Well, from here on in, you get up at six o'clock... and we'll have breakfast about nine or ten. By that time, you'll have gone all over the job and will know what you're going to do the rest of the day and what you think are going to be problems.' And around noon, he'd walk across by himself, look at the things, and at night he'd talk it over with you again."

But Dr. Ford reserved a special place of honour for his long-time mentor at U of A Engineering. Dean R. M. Hardy was not Dr. Ford's favourite teacher: "When he lectured, it was like you had a root canal!" But Dr. Ford respected Hardy as an engineer and a dean: "He was probably the smartest engineer in western Canada. When he got down to talking to you, he really told you an awful lot about engineering. He was dedicated to engineering more than anything in his life... a professional. His ethics were beyond belief. But he was not a driver; he was a leader... Dean Hardy left me with the idea that you have to have a most elastic imagination."

Hardy influenced Dr. Ford's life for decades. In 1942, he prevented Dr. Ford from leaving school early with the other top students until he'd written all his final exams. Dr. Ford achieved "great distinction" and won two $50 prizes as well as a gold medal. On Dr. Ford's return from Stanford, Hardy asked him to set up a mechanical engineering department—curriculum, staff, space, and students—and made him its first head. Dr. Ford worked under Dean Hardy and modelled his own vision of leadership after Hardy as well. When I first asked Dr. Ford for an interview, he cried out, "No way! Hardy was the greatest dean we ever had. Write an article about Dean Hardy, and then you can come talk to me!"

Over time, of course, many of Dr. Ford's students became colleagues. Faulkner calls Dr. Ford his "professional father. He was always there when I needed him... He [had] a gruff exterior when you first [met], but you soon [knew] that underneath [was] a lot of caring."

"You don't crack the whip. You lead 'em," said Dr. Ford. "Newton has three laws of motion. And the fourth law is, 'You cannot push a rope.'"

Dr. Ford was offered many opportunities to join former students and colleagues in exciting new ventures in business, research, and at other universities, but he was happy to stay at U of A. He loved Alberta and his alma mater, and he'd created the life he wanted here in Edmonton: the ongoing challenges of teaching and of strengthening the Faculty and the engineering profession; opportunities to travel, consult, and chair committees, locally and nationally; a rich family life and community involvement; and long-standing friendships with colleagues and neighbours.

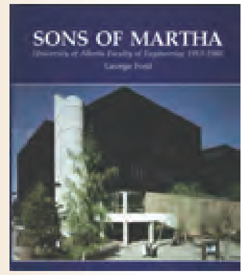
From the stories he'd heard, Dr. Ford loved to imagine the engineers and leaders before his time who had dreamed of building a university here and made it happen. Even though he'd never met them, he was walking in the same halls and loved to tell his students about the characters he'd known and how they'd contributed to the university and the profession of engineering. With his own life spanning from the end of World War I into the 21st century, Dr. Ford embodied the sense of history at U of A Engineering. He became the connecting link between those who'd paved the way before him and those who would build on what his generation had accomplished.

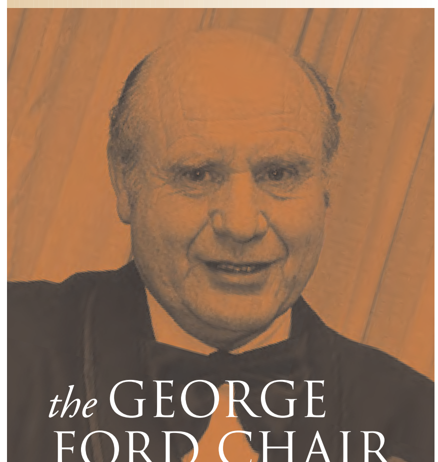
EDITOR'S NOTE: *Excerpts of the interviews and research collated by Susan Beach for these articles were used by Dean Lynch at the June 1 memorial service for Dr. Ford and in the* Edmonton Journal's *June 4 "Life and Times" tribute to Dr. Ford's life.*

Susan Beach is a Edmonton-based writer and editor and a family friend of the Fords.

SONS OF MARTHA
our story

For U of A Engineering's 75th anniversary, Dr. Ford wrote *Sons of Martha: U of A Faculty of Engineering 1913–1988*, a 259-page, illustrated history, both official and not, telling the plans, meetings, and turning points in the Faculty and describing the lively characters who made it happen. The book was a huge undertaking and a labour of love. Former Dean Otto, who asked him to write it, believes that Dr. Ford "was perhaps the only person who could have put *Sons of Martha* together. He [had] a deep interest in people, and few [others] have demonstrated the love that he [had] for the university and for the profession... [George had] a commitment to fairness and honesty, and I think people respect him for that and they always will. I knew that he would be interested; he put his whole effort into it, and he did a marvellous job!"





the GEORGE FORD CHAIR

To acknowledge a lifetime of commitment and dedication, the Faculty of Engineering has established the George Ford Chair in Materials Engineering. This endowed chair is supported by family, friends, alumni, and corporate partners.

In Memory of Dr. Ford

I graduated in the second mechanical engineering class in 1961. I was motivated to obtain a PhD in mechanics at the University of Illinois because of the guidance and leadership of Dr. Ford in the classroom. I remember him with great and fond affection.

Dr. Gordon W. Bigg (Mechanical '61)

George Ford was a friendly, straightforward person who seemed too honest to become a Dean. He, Don Ross (Civil '40), and Henry Kreisel were anomalies in our senior administration, as Art McCalla and Walter Johns had been before them. I owe all of these people a debt of gratitude. George assisted the birth of the trend-setting Radiation Research Centre (RRC) in 1964. The future Interdisciplinary Sciences Building will be a large version of the RRC. Henry helped build the magnificent collection of books in the University Library. Walter shared his flair for the Latin language. Art and Don honoured and encouraged productivity instead of politics in scholarly work.

I hadn't seen George for five years or so. I was saddened to learn of his death, but gladdened by the warm memories that flooded back. Thank you for gathering these remembrances.

Best regards,
Dr. Gordon Freeman (Professor emeritus)

Thank you for the informative articles concerning the life of Dr. George Ford. I am not an engineer, but I would like to share my personal experiences with Dr. George and Catherine Ford with those who loved them. It was September 1949, and a large group of grads from the high school in Brooks, Alberta, were traveling by CPR train to Edmonton to attend the U of A. We were a close-knit group, primarily from small rural villages of the Eastern Irrigation District, who had lived in the School Dormitory in Brooks in order to obtain our high school education, and we were "green as grass." The Fords understood our excitement and fears for they too came from small communities. Catherine Ford (née Pierce) had been our English teacher. It was she and the other members of the excellent high school staff under principal Alvin Kunst that had encouraged us to continue our education at the U of A. Dr. George and Catherine met us at the Old Strathcona CPR Station and began their counseling and nurturing of the "frosh" from Brooks. They offered us meals and then transported us to Pembina Hall, Assiniboine Hall, Athabaska Hall, St. Joseph's College, and St. Stephen's College, where we were to reside during our first year.

Throughout that year, they were our mentors and our friends, listening to our tales of woe and success. We moved in and out of the Ford home receiving support and encouragement as if we were their own children. The results? Every one of us completed our studies and graduated.

The campus at the U of A was a warm, welcoming place thanks to Dr. George and Catherine Ford. I believe they continued to give other students their support throughout the years. They both were committed educators and our campus experience was enhanced because of them.

I went on to teach English, primarily, for 30 years, thanks to their encouragement and Catherine's excellent example. It is not only the Faculty of Engineering that honours them.

Yours truly,
(Mrs.) Alice Chelich (née Blaskovits)
Fairview, Alberta

It seems odd that Dr. George Ford would not last forever. Today's obituary notice reminds us that even engineers are made of blood and bone; it also underscores that the very best ones live their lives as if they were made of concrete and steel.

I have a wonderful photograph in front of me as I write this: it is taken at Convocation in 1995. It shows Dr. Ford holding my dad's (W. S. Ziegler, BSc '95, Brigadier [retired]) very shaky arm as they walk towards Chancellor MacTaggart to receive congratulations. (As I recall, Dean Lynch had just spoken, offering Dad for an "honest-to-God" BSc Engineering.) Dad is beaming. Dr. Ford has a wonderful, reflective smile on his face, and he looks quite pleased.

My family owes so much to Dr. Ford (and Dean Lynch, and Vince Duckworth, when he was still with your Faculty) not only for being such good friends to my dad over the years, but for helping recognize his lifetime's worth of accomplishments and for finding a way to make sure that my dad got his "honest-to-God" BSc. Dad was so proud of the fact that he earned that degree. It meant so much more to him than even a PhD honoris causa would have. Truly.

I can only hope that the same efforts will be expended on Dr. Ford's behalf. If so, his name will be up in very bright lights, and as was his nature, he'd be embarrassed, of course. That's how I shall remember Dr. George Ford: modest, plain-spoken, fiercely proud of his Faculty and his engineers, and ever anxious to talk up both. He was as proud of my dad as I know my dad was of him. Dr. Ford's good works won't be buried with his bones. They will last for generations. Look around and see them, hard at work, just as he would have wanted.

With fond remembrance and kind regards,
Rod Ziegler
Halifax

I was saddened when I heard the news of Dr. Ford's passing. We first met at the University of Alberta when I was a student between 1953 and 1958, and although I did not know him well at that time, it was after I became a practicing barrister and solicitor that we became involved in a number of matters when I called him as an expert witness in cases that I was handling.

When on the campus, I knew that Dr. Ford then had an outstanding reputation in the field of engineering. I did not realize how great this was until I retained him to act on files where I required his expertise. More important, Dr. Ford was always a gentleman, and he never wore his achievements in a manner to enhance his stature. Simply stated—he was a humble and an engaging individual who had excellent communication skills and was recognized first and foremost as a gentle person.

Individuals' reputations are often established on the contributions that they make to society to make this world a better place in which to live. Dr. Ford will be remembered for this and more.

May he rest in peace.

Yours sincerely,
Allan H. Wachowich
Chief Justice
Court of Queen's Bench of Alberta

good. vibrations

Building for Nanoscale Research and Beyond

In designing the National Research Council's National Institute for Nanotechnology (NINT), the planning team of architects and engineers looked for good vibrations—those that were small enough to satisfy the sensitive equipment used for nanoscale research.

The task of finding good vibrations for NINT began at site selection. No amount of noise modification (and attendant cost) can mitigate a noisy site. Luckily, the site selected for NINT is 50 metres away from the roadway and far enough from traffic to be a good bet.

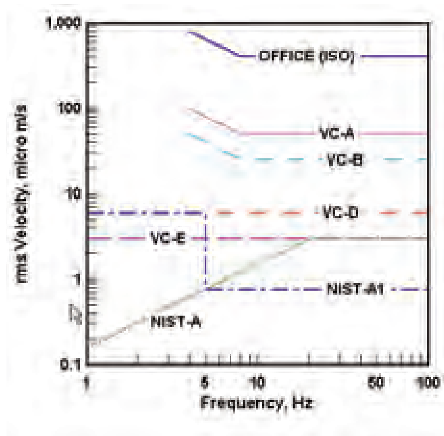
The next step in the search for good vibrations was selecting appropriate flooring for the building. Three configurations were constructed: a large solid slab of moderate thickness; a smaller slab "island" of greater thickness (900 mm) surrounded by a thinner slab, both resting directly on soil and separated by a gap; and another island of the same dimensions, but resting on four concrete piles.

Field measurements were made for areas of the buildings where sensitive equipment will be positioned on either suspended floors or grade-supported structures. The three locations were instrumented and measurements taken allowing comparison of the performance of these configurations at attenuating ambient vibrations and vibrations due to a passersby. (The diagram shows the vibration measures at various floor locations in NINT.)

How did each floor perform? Not surprisingly, the floors that performed the best were those at grade or below grade, this due to the attenuating properties of ground soil. So what's the catch? This is where the human factor interfaces with the structural. Most researchers do not want to work in the basement.

Human factors are not the only consideration. Cost factors come into play. By far the most cost-effective method was the large solid slab of moderate thickness. However, it could not be universally applied as flooring throughout NINT because it did not meet the technical requirements.

Just what is the optimal spot for vibration sensitive equipment in NINT? Acoustic experts refer to this optimal spot as the "sweet spot." NINT's "sweet spot" is in the northeast portion of the building on an isolated slab, furthest from the roadway and nearest the columns.



Vibration criteria vary according to space types, research functions, and structural systems.

What were the "lessons learned" in good vibrations for the NINT construction team?

Select a good site.

Do preliminary acoustic measurements and then monitor as construction proceeds.

Find the acoustic "sweet spot" and place most sensitive equipment there.

Vibration measures cannot be considered in isolation. Human and economic factors also come into play.

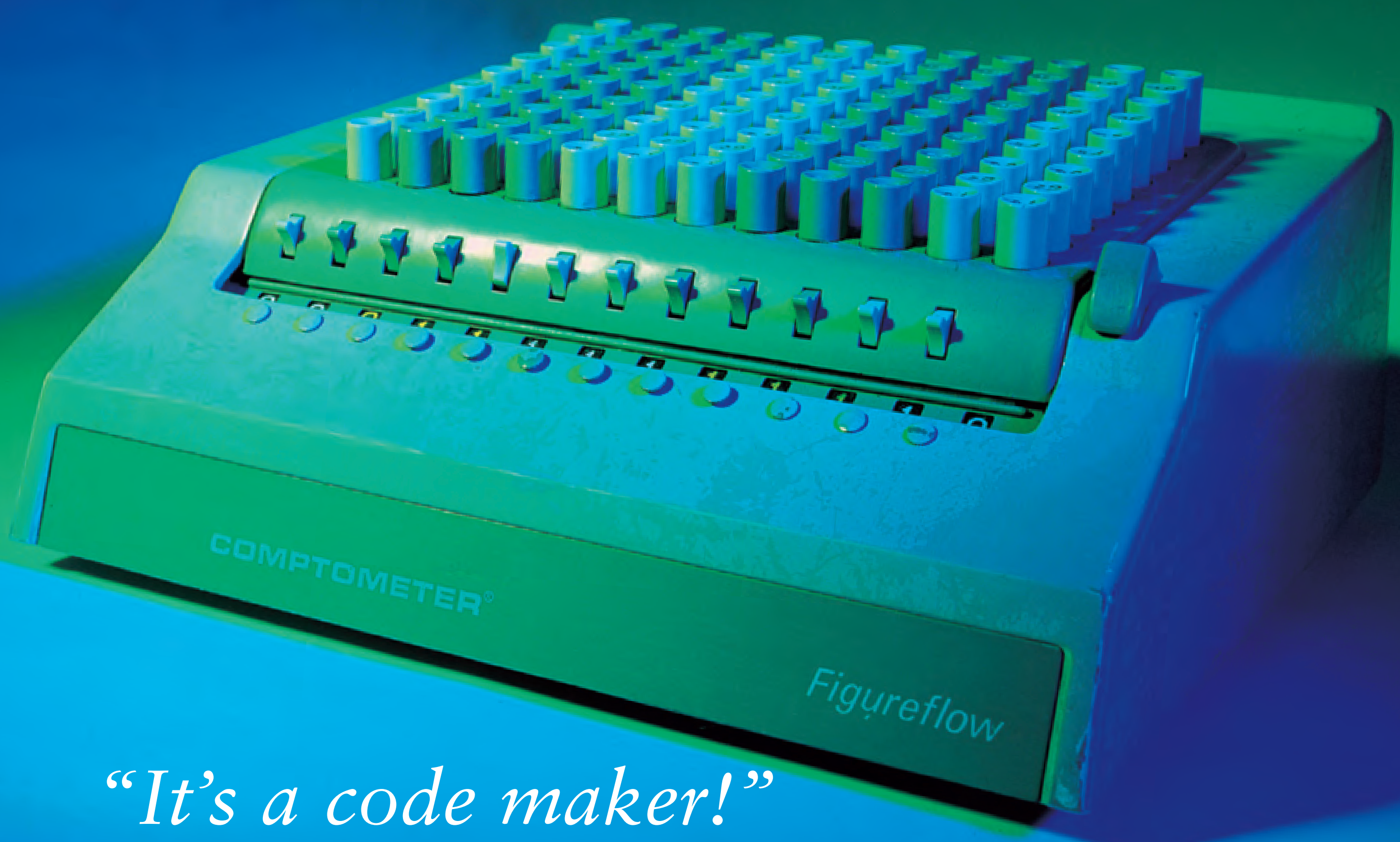
These lessons will assist designers in the planning of good vibrations for nanoscale research facilities in the future.

Content provided by Phil Haswell, Director of Facilities for the Faculty of Engineering, and

Dr. C. James Montgomery (Civil '73)

Cross Hairs on History

the *Mystery* Machine



"It's a code maker!"

"It's a punch card maker!"

"It's an enigma machine!"

BY WANDA VIVEQUIN

Actually, it's the SUMLOCK COMPTOMETER, *a not-so-distant relative of what we now know as a calculator.*

For people over the age of 50 involved in the world of accounting and business, the name may well remind them of the cavernous rooms full of comptometer operators busily adding and subtracting great rows of numbers.

There were even comptometer schools where operators were trained to use the machines. Comptometers became obsolete as the age of microprocessors forged ahead, but they remind us of the days before calculators could fit onto the face of a watch.

It was encouraging to hear from current Electrical and Computer Engineering students at the U of A that the comptometer has features that made it a far more reliable adding machine than modern-day calculators and computers.

The students had decided to dismantle and repair one of the U of A's comptometers, which had been suffering from one or two mechanical problems. In the process of disemboweling its moving parts, they discovered things that both impressed and inspired them.

"Some interesting features include a manual lock to prevent negative numbers," says Travis Martin, a fifth-year Engineering Physics student. This means when the zero/reset lever is depressed, it locks the subtraction mechanism. It is not possible to do, for example, zero minus nine equals negative nine.

"Another interesting feature is the ability to depress multiple keys, which you cannot do with a modern calculator, limit[ing] the speed of the user," he says. "This feature certainly impresses me in that, in today's age of computers, simple issues such as this are often missed in the digital world and create horrid user errors and program crashes from careless programmers."

The comptometer was invented by American Dorr Eugene Felt and was eventually patented in 1887. It was the first successful key-driven adding and calculating machine. Key-driven means that numbers are added to the total just by pressing the keys; no other action is required.

At the age of 22, Felt, then working in a machining shop, decided to apply a technology used in planing machines to control the depth of a cut to a calculating machine. He began working on the first rough model of the comptometer over the Thanksgiving holiday in 1884. His first obstacle was to find a box of the right size. He eventually settled on a macaroni box.

In his own account of the construction, Felt explained how he used what he could to design the world's first key-driven adding machine:

"For keys, I procured some meat skewers from the butcher around the corner, and some staples from a hardware store for the key guides, and an assortment of elastics to be used for springs.

"I soon discovered there were some parts which would require better tools than I had at hand for that purpose, and when night came, I found that the model I had expected to construct in a day was a long way to be complete or in working order."

Just over a year later, after many refinements, Felt finished his working model. The "macaroni box," as it was always referred to, now resides in the Smithsonian.

Word about Felt's new adding machine got out, inspiring investors. By 1888, the first serious manufacturing and sales of the comptometer was underway.

The comptometer was manufactured by Felt and Tarrant Manufacturing Company of Chicago and was recognized as the first truly practical and commercially-successful mechanical adding machine in the world. Other companies also produced the machine.

Over the years, the machine evolved in size, materials used, and the complexity of calculations that could be carried out. Its basic function is addition. One column of keys is assigned for each decade. When a key is pressed, that number is added to that decade and will carry to the next highest decade if applicable.

Comptometers revolutionized the way lists were added. Operators were specially trained to enter all numbers in parallel at the same time. In contrast, a modern calculator only has 10 digit keys—the digits of each number can be entered only one at a time.

Multiplication, subtraction, and division were also possible, although somewhat more complicated.

Although Felt died in 1930, the comptometer was used extensively until the 1970s.

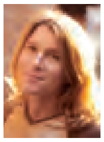
"For keys, I procured some meat skewers from the butcher around the corner, and some staples from a hardware store for the key guides, and an assortment of elastics to be used for springs."

Computers and calculators gradually took over, although many operators continue to insist that comptometers were much quicker. On several websites, they reminisce about the good old days (just Google "comptometer" and see for yourself).

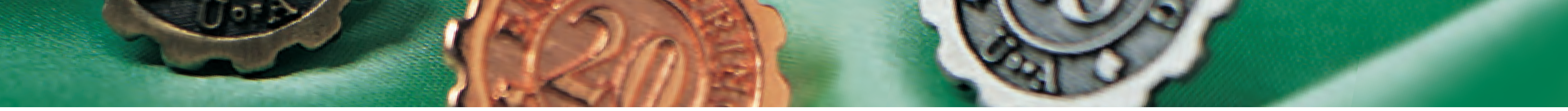
Meanwhile, back at the U of A, the students of the Electrical Engineering Club eventually managed to fix the comptometer's broken bits. The experience gave Martin a whole new perspective on technology.

"Concentrating on the mechanical devices encourages the view, at least for me, that the children of the digital era have grown up lazy. They don't build them like they used to!"

EDITOR'S NOTE: *Interested in exploring the intricacies of the comptometer for yourself? Do you have an interesting artifact that would inspire a future story? Please contact Sherrell Steele at 780.492.4514.*



Wanda Vivequin is an Edmonton-based journalist and is far too young to remember the comptometer.



Finding your way around

September 29 to October 2

REUNION 2005

Reunion schedule at a glance

FRIDAY, SEPTEMBER 30

DEAN'S RECEPTION

4:30 - 7:00 p.m., ETLC Solarium, 2nd Floor,
Engineering Teaching & Learning Complex (ETLC)
(for all engineering alumni)

SATURDAY, OCTOBER 1

DEAN'S BRUNCH

9:00 - 11:00 a.m., ETLC Solarium, 2nd Floor,
Engineering Teaching & Learning Complex (ETLC)
(for all graduates from 1960 and earlier, and their guests)

SATURDAY, OCTOBER 1

ENGINEERING OPEN HOUSE

9:00 - 4:00 p.m.,
Engineering Teaching & Learning Complex (ETLC)

The Faculty of Engineering is pleased to welcome prospective students, parents, and alumni to Engineering Open House 2005. Take in displays from the four Engineering departments and numerous student groups and enjoy one of the department tours that will be available. The Alumni Hospitality Lounge will be open to provide a quiet place to enjoy a coffee and catch up with old classmates.

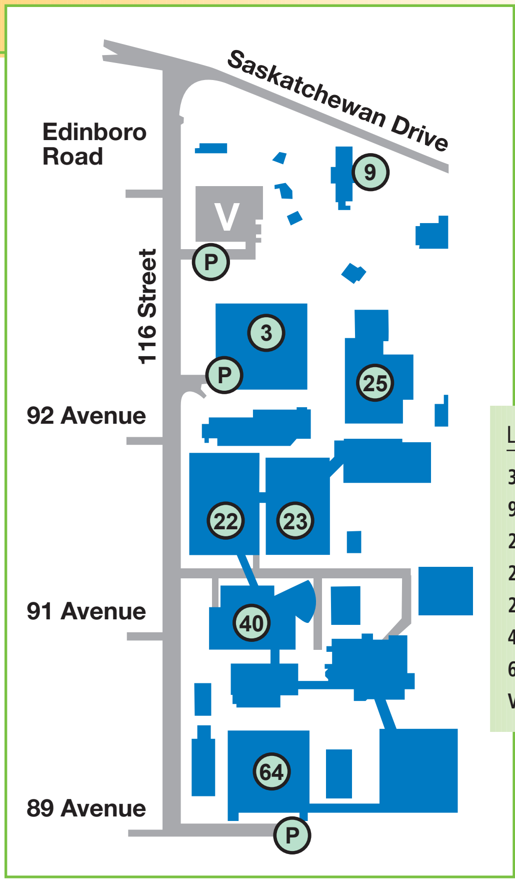
The Faculty will also present free lectures throughout the day. Those of particular interest to alumni include the Dean's Forum on the Faculty of Engineering at 11:30 a.m., followed by lectures at 1:15 p.m. and 2:00 p.m. by some of the Faculty's brightest researchers on a variety of topics. Please refer to *www.engineering.ualberta.ca* for further details. As well, for alumni with children (or grandchildren) now considering entering Engineering, the Faculty will present an overview of our undergraduate programs and admission requirements at 10:00 a.m. All lectures will take place in the Engineering Teaching & Learning Complex.

We have provided these maps to assist you in locating special activities over the weekend.

Enjoy your visit to the U of A campus.

Main Campus (NW) Parking Directions

Here is a map of the northwest corner of campus. The Electrical & Computer Engineering Research Facility (ECERF), building 22, is the location for underground parking reserved for those with mobility challenges. Parking is available in Windsor Car Park (location 3), Stadium Car Park (location 64), and Lot V.

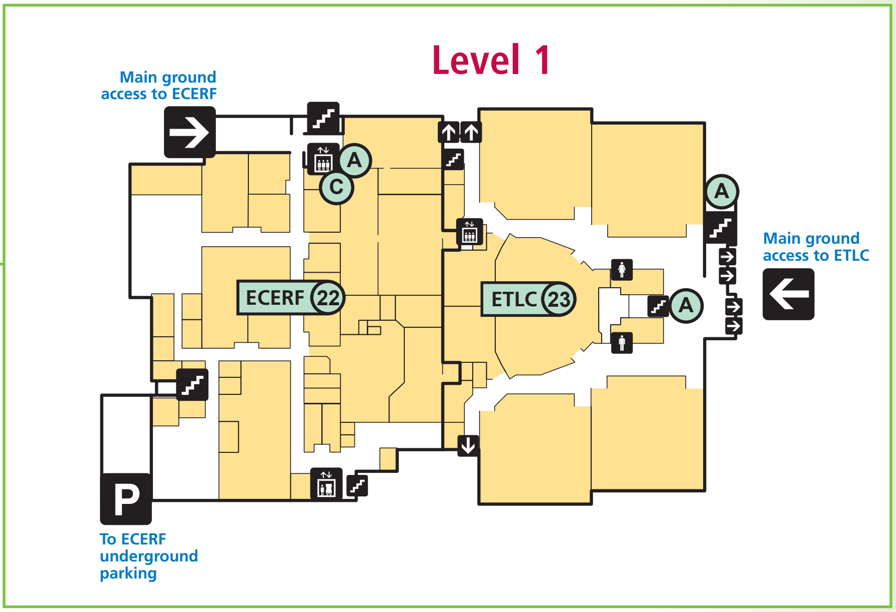


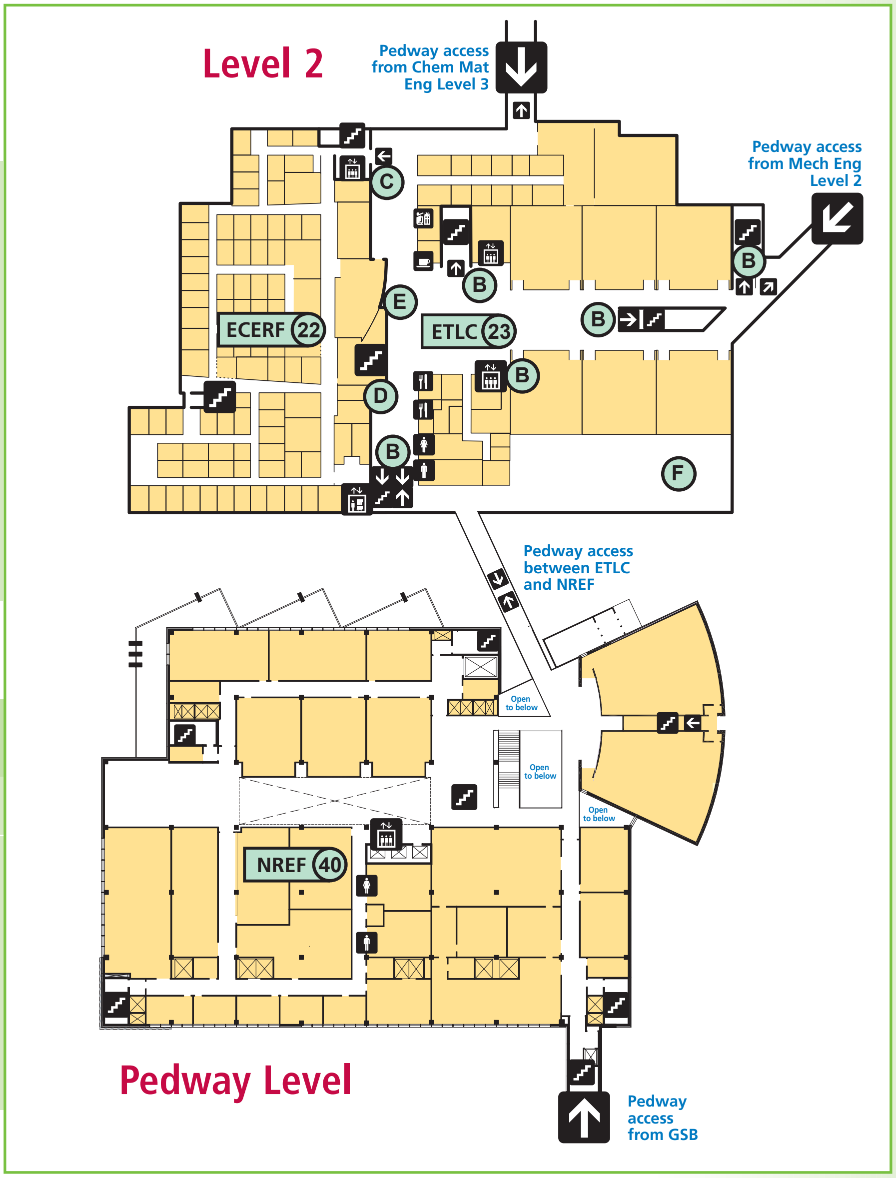
LEGEND

- 3 —Windsor Car Park
- 9 – Faculty Club
- 22 – ECERF
- 23 – ETLC
- 25 – NINT
- 40 – NREF
- 64 – Stadium Car Park
- V – Parking

Electrical & Computer Engineering Research Facility (ECERF) and Engineering Teaching & Learning Complex (ETLC)

Here is a close look at Level 1 and Level 2 of the Electrical & Computer Engineering Research Facility (ECERF) and Engineering Research & Teaching Complex (ETLC). The map marks the street-level entrances. Site signage will help you find specific room locations once you arrive.





ECERF, ETLC, and Allan P. Markin/ Canadian Natural Resources Ltd. Natural Resources Engineering Facility (NREF) LEGEND

- A – Level 1 access to and from Level 2
- B – Level 2 access to and from Level 1
- C – Elevator access to and from underground parkade
- D – Stairway access to alumni hospitality lounge on the 3rd floor
- E – ETLC Poole Family Atrium
- F – Dean's Reception and Dean's Brunch in ETLC Solarium

Future Alumni Event

NOVEMBER 3, 2005

CHEMICAL, MATERIALS, AND METALLURGICAL ALUMNI RECEPTION

7:00 - 9:00 p.m., ETLC Solarium, 2nd Floor, Engineering Teaching & Learning Complex (ETLC)

A 'Small' Tunnel Project Earns Big Recognition

BY TOM KEYSER

During a distinguished career in project management, Art Washuta (Civil '73) has worked on plenty of high-profile construction jobs. He has reason to be proud of each one.

Among them were the Oldman River Dam spillway, the environmental cleanup of DEW Line sites for the Department of National Defence, and the Anthony Henday Drive southeast extension in Edmonton, to name a few.

But the Edmonton-based regional vice president for UMA Engineering Ltd. professes a soft spot for one of his most recent efforts: the $30-million tunnel and portal project for Edmonton's south LRT extension, which captured Awards of Excellence in project management and in transportation infrastructure in the 2005 Consulting Engineers of Alberta Showcase Awards.

"Yes, that would rank right up near the top," agrees Washuta, whose company shared the honour with Stantec Consulting Ltd., the City of Edmonton's managing consultant for the project. "Just rubbing shoulders with the world-class experts we worked with was a pleasure as well as a learning experience.

Washuta adds with a chuckle, "I wouldn't call it a huge project, but it sure had its unique challenges."

Washuta isn't kidding. Among the more startling of those unique challenges was the minor matter of importing a massive earth pressure balance tunnel-boring machine from a remote job site in Singapore, piece by piece.

The enormous machine, manufactured in Etobicoke, Ontario, by Lovat for its first application in 1999, crossed the Pacific by freighter. Once the expensive cargo reached Edmonton, technicians at the site began the task of reassembly, a process which took several months.

But this tunnel-boring machine was worth the time and trouble. Though he's managed tunnel projects in the past, Washuta was particularly impressed by the efficiency of the state-of-the-art monster.

As the name implies, the Lovat machine minimizes the risk of ground loss by balancing earth pressure at the tunnel face against the thrust pressure of the machine, while controlling the rate at which soil is removed by a screw conveyor.

A number of other wrinkles set the LRT tunnel and portal project apart from the ordinary.

Right from the start, Washuta worried that it might be difficult to attract qualified private tunnelling contractors required to complete a project that could be considered small potatoes, in a relative sense. So the preliminary design team tendered the project in two different methodologies, in the hopes of creating greater contractor interest.

"Early on, we realized that both methodologies (either tunnel boring or sequential excavation) were perfectly feasible and cost- effective," he says. That freed up the team to go either way, depending on contractor response.

Meanwhile, his team advised the city to advertise internationally for expressions of interest and the effort drew a promising response: a dozen bites. A process of pre-qualification narrowed the bidders to six.

In the end, PCL-Maxam, a Joint Venture came aboard as general contractor, with Aecon-McNally, a Joint Venture acting as tunnelling subcontractor.

The contractors booked on to a tricky job because the geometry of the project presented problems.

"We had two tunnels six metres in diameter and only two to six metres apart. Within a distance of 300 metres for each tunnel, and another 200 metres for the portal, we had to contend with a 250-metre horizontal curve and a six percent vertical grade," Washuta recalls.

"In addition, the tunnels traversed a number of different geological ground conditions. Plus, we passed beneath a couple of buildings and a major utility services tunnel."

As it dug its relatively short passage, the tunnel boring machine churned through a veritable smorgasbord of subterranean strata: dry sand, glacial clay till with wet sand layers, and finally Edmonton formation bedrock. Still, it forged its way towards University Station, twice.

The team had to keep close tabs on nearby buildings.

"I think we had 150 instrumentation points to monitor for building and ground settlement as we were tunnelling under the University of Alberta Education Building car park and St. Joseph's College. Every day we assessed the situation," Washuta says.

Settlement of the car park's footings never exceeded 230 millimetres, which is "pretty remarkable."

The excavators also had to proceed with extreme caution when their route took them beneath the 1960s-vintage utility services tunnel, which carries water, electrical, and mechanical systems to the U of A .

It all adds up to just another "small" project, in Washuta's modest estimation. Clearly, the Consulting Engineers of Alberta judges saw through that label.

EDITOR'S NOTE: *Reprinted with permission from* The PEGG, *May 2005*

Tom Keyser is a Calgary-based journalist.

Jason Slater, Slater Studios

Edmonton's South LRT Tunnel Presents Unique Challenges and Wins Two Consulting Engineers of Alberta (CEA) Showcase Awards.

The massive tunnel-boring machine helped the project team win two CEA awards.

engineer.alum @ualberta.ca

Chemical Engineering

Laureshen, Bill (Chemical '52)

I am now fully retired and therefore have no exciting promotion or foreign trip to announce. In fact, my life is rather dull at the moment, and I am looking forward to the golfing season like many of my contemporaries.

Nichol, Ken (Chemical '61)

As a self-employed engineer, I have graduated from chemical/plastics technology to new housing construction technology with application in low-to-modest-income affordable housing of the multi-family kind for Greater Edmonton inner-city. I believe, as a result of technological innovation, that engineered factory-built modules and fire-resistant panel systems will replace costly, inefficient, traditional building in a mud puddle. They are faster built and superior quality. My motto is creating value through home improvement.

I've had no career changes, promotions, or family additions. Travel plans? Yes, I travelled to Las Vegas and Palm Springs on June 22 to get married again. As for my volunteer activities, I am president-elect of the Alberta Council on Aging, Edmonton Chapter, and an active volunteer member of the Alberta Committee of Citizens with Disabilities. I also belong to the Downtown Edmonton Community Association, the Community Economic Development, the Canadian Association of Retired Persons, and Northern Alberta Sports Car Club (so far as a course marshal waving flags at Champ Car races).

Civil Engineering

Glucksmann, Pedro (Civil '67)

I have been in the practice of engineering for many years now. I am semi-retired and travelling the world on my sailboat with many adventures. Also, I have been giving lectures in different places regarding the profession. I'm in Thailand now and been under way for the last six years. I started the trip from Venezuela in the Caribbean Sea, taking me through the Panama Canal, the islands of the South Pacific, New Zealand, Australia, Indonesia, and South East Asia.

Proctor, Philip (Civil '47)

Between 1947 and 1957, I was an irrigation construction engineer for the federal government. I worked on the St. Mary River and the Bow River Development Project. After being a partner in three firms and a senior structural engineer with four Edmonton-based firms, I established my own civil and structural consulting engineering firm in 1984. There are over 300 buildings in Alberta, Saskatchewan, British Columbia, and Northwest Territories with my stamp on their plans. I was also a founding member of the Edmonton Society of Structural Engineers and served as its vice president and president. The crown of my career, however, was the site, foundation, and structural engineering of the Edmonton Temple of the Church of Jesus Christ of Latter-Day Saints. My greatest personal achievement is my family: my wife, Darlene Sabey, eight children, 20 grandchildren, and four great-grandchildren.

Electrical Engineering

Tahiliani, Sunil (Sonny) (Electrical '94)

I have lived in New York City for the last couple of years. I started an aeronautical (avionics) engineering consulting firm (Technology Software LLC) two-and-a-half years ago with a business partner. We currently have offices in four cities in the U.S. including Phoenix, Boston, New York City, and Grand Rapids. I enjoy living with my girlfriend in New York, and we recently attended the U of A alumni dinner and skating in Central Park function, which reminded them that skating is quite a bit different than skiing. I keep busy with the business, pursuing a Master's degree in history, and socializing with friends at my favorite bars in the city and in Brooklyn.

in memoriam

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

Blackadar, Murray (Chemical '49)
Campbell, Archibald (Electrical '52)
Coad, Alfred (Petroleum '51)
Clarke, Robert H. (Chemical '55)
Cronkhite, Robert (Civil '50)
Darimont, Albert (Chemical '45)
Deines, Clarence (Electrical '51)
East, Charles (Petroleum '52)
Findlay, Stewart (Electrical '40)
Forbes, Victor (Civil '64)
Greaves, Frederick (Mining '59)
Hanson, Carl (Civil '50)
Hoar, C. Richard (Electrical '40)
Homme, Robert (Civil '67)
Mar, Dean (Civil '02)
McEachern, Don (Chemical '48)
Michaud, J. Ed (Petroleum '56)
Riddell, Joseph (Mining '56)
Warne, Jim (Civil '57)

errors and omissions

The list of photo credits for the Summer 2005 issue neglected to include John Chambers and Rod Clarke. Thanks for your contributions of images of the Halifax NA337.

On line four of page 39 of *U of A Engineer*, Summer 2005, there was an error in SI units. The mass that is being lifted is 13,000 kg. The force required to lift the plane is approximately 130 kN (kilonewtons). Thanks to Dr. R. Loov (Civil '58) for this correction.

Petroleum Engineering

Acosta, Luis G. (MSc Petroleum '94)

I am Canadian and Colombian. I am married to Alexandra, an IT engineer, with one son (15 months old) whose name is Juan Camilo, and he is our reason to live. I have lived in Canada (Winnipeg, Toronto, Edmonton, Red Deer, and Calgary), U.K. (London), U.S. (Texas), and now in Bogotá, Colombia, South America. I worked with Schlumberger for two years and with BP for approximately 10 years now. I am currently the petroleum engineering manager for BP Colombia.

My future plans are to continue growing my leadership and interpersonal skills to positively impact society and the world in general (make this a better place to live for everyone in this planet).

Capitalizing on collaboration

The definition is simple: to work jointly with others.

For Dr. Jacob H. Masliyah, collaboration is a way of life.

The constant dialogue between Dr. Masliyah, his industrial partners, and other researchers is contributing to rapid advance in oil sands techniques through engineering and science fundamentals.

Dr. Masliyah holds the NSERC Oil Sands Research Chair in Oil Sands Engineering in the Department of Chemical and Materials Engineering at the University of Alberta.

Working with several industrial partners, Dr. Masliyah knows firsthand the type of research he is conducting cannot be performed in isolation. He values his industrial and academic partnerships.

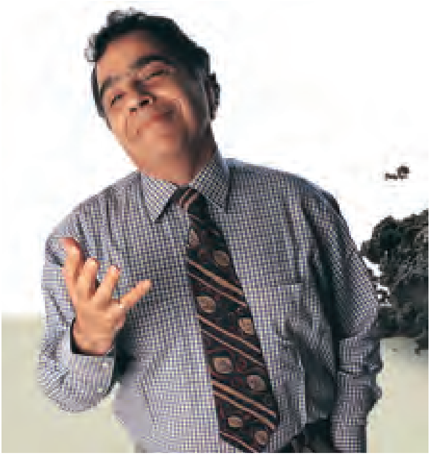
"I need input from my industrial partners to mould and create practical application to my research, just as I need input from my colleagues," says Dr. Masliyah.

Through collaboration, Dr. Masliyah has developed solid relationships within the industry. There is a mutual respect and trust among all parties involved, fostered by the open exchange of knowledge. He describes the process as a bit of a juggling act.

"I have an established feedback loop with my supporters, including Syncrude Canada, Albian Sands Energy, Canadian Natural Resources Limited, Suncor Energy, Champion Technologies, Nalco Canada, and Baker Petrolite. Through our exchanges, we begin to optimize what we do. It is the back-and-forth knowledge exchange that leads to success."

Research plays an ever-increasing role in advancing technology and processes as the Alberta's oil sands industry works to both maximize oil recovery and meet environmental needs.

"There are real solutions coming out of our research. There will be a better product at the end of the day because of industry's responsiveness to what we do. They



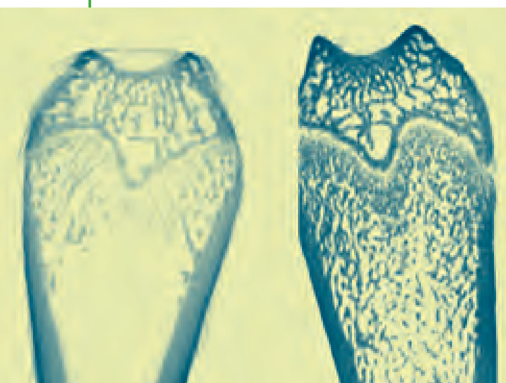
recognize that analysis at the molecular level can answer questions, leading to better understanding of the big picture," he says.

Dr. Masliyah will continue to work collaboratively within the industry using both fundamentals and the latest technology and techniques in his research. Society will continue to reap the rewards.

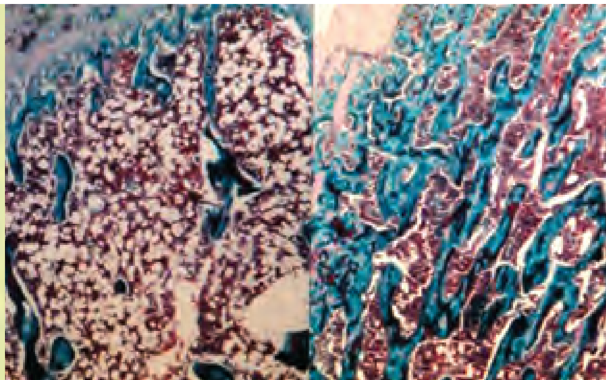
Raising the Bar

What do chemical engineering and intellectual property law have in common? As a former product development engineer with Dow Chemical of Canada, Gerald (Gerry) Oyen (Chemical '59) has used his engineering experience to give him a leg up in the field of intellectual property law. As co-founder of western Canada's largest intellectual property law firm, Oyen Wiggs Green & Mutala LLP, Oyen has become an expert in many different areas by immersing himself in his cases. To read more about Oyen, go to page 19 of the Fall 2005 edition of *U of A Engineer*.

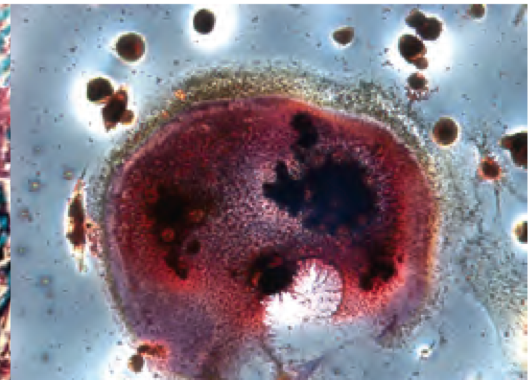
Conquering OSTEOPOR



Osteoporotic bone Healthy bone



Osteoporotic bone Healthy bone



Osteoclastic cell

Dr. Uludağ uses a vast combination of tools to get the complete picture for his research, from conventional x-rays and microscopes to sophisticated cryostat sectioning.

Left: Dr. Uludağ views healthy and osteoporotic bones first by x-ray. The internal structure of bones is lost in osteoporosis.

Middle: Drilling down a level, Dr. Uludağ then views bones analyzed through cryostat sectioning, where bone samples are frozen and cut with a diamond knife. Using histochemistry, he is able to study the chemical composition of cells and tissue.

Right: On a cellular level, Dr. Uludağ uses traditional microscopes to view osteoclastic cells, which are genetically programmed to dissolve bone tissue. An increase in bone mass is observed when these cells are inhibited.

More women die each year as a result of osteoporotic fractures than from breast and ovarian cancer combined.

Working in the Department of Chemical and Materials Engineering at the University of Alberta, Dr. Hasan Uludağ is developing a biological delivery vehicle to administer bone-building pharmaceuticals to people suffering from osteoporosis.

"Osteoporosis is a disease we all face with age. If there is an imbalance in the bone-building cycle, where too much bone is broken down and not completely rebuilt, your bones become weaker, and you become more susceptible to fractures. As people are living longer, we need to increase the quality of life—make people healthier later in life."

According to Health Canada, one in four women and one in eight men over the age of 50 has osteoporosis. Consider the rate at which the Canadian population is aging, and it is feasible to see the cost of treating osteoporosis and related fractures climb rapidly from today's estimated cost of $1.3 billion.

"Therapeutic agents capable of stimulating new bone formation form the basis of a new class of drugs that will not only slow bone loss, but will also have the potential to restore the lost bone mass. We are trying to 'engineer' the carriers that will target the growth factors to the bones," says Dr. Uludağ.

"If we can put together the proteins that stimulate bone growth with the molecules that go to the bone, we'll have a 'magic bullet' for the bone diseases."

A decrease in bone density is not physically felt—most people don't know they suffer from osteoporosis until they incur a fracture.

While Dr. Uludağ is focused on research, he is equally focused on educating and training his students.

"If we can put together the proteins that stimulate bone growth with the molecules that go to the bone, we'll have a 'magic bullet' for the bone diseases."

"It's important for students to develop their own thoughts, to propose different solutions to the same end-goal. When I see a student with passion, with a fire burning inside, I try not to be an impediment. I try to channel their energy into the right path," says Dr. Uludağ.

"Most students don't think it's possible to use engineering in biology. I try to teach them how to use engineering principles in biological systems. You can apply fundamentals anywhere."

His research philosophy is to generate ideas. From the ideas, different approaches can be pursued.

With a strong moral compass, Dr. Uludağ hopes to make a unique contribution to society, whether by developing a new class of drugs for osteoporosis or by inspiring his students to be the best they can be.

OSIS

Osteoporosis Facts

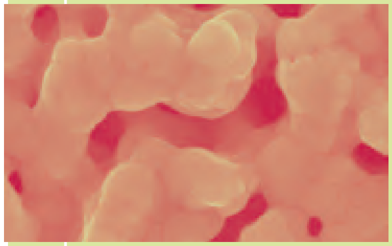
- 1.4 million Canadians suffer from osteoporosis.
- The cost of treating osteoporosis and related fractures is estimated to be $1.3 billion a year in Canada.
- Over the next 25 years, Canada will spend $32.5 billion treating osteoporotic fractures.
- Vertebral fractures are the most common type of fracture, accounting for more than 45 percent of all osteoporosis fractures.
- Eighteen percent of women over 50 and 27 percent over 65 have one or more vertebral fractures.
- Women with clinically diagnosed vertebral fractures have a 1.5 percent higher mortality rate than women who do not.
- Hip fractures result in death in up to 20 percent of cases and disability in 50 percent of those who survive.
- Long-term nursing care is required for 7.8 percent of those who suffer fractures.

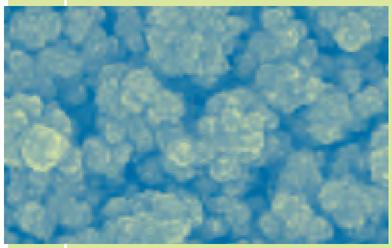
Student CENTRAL

Patricia Nadworny

Thanks to the work of researchers like Patricia Nadworny (née Taylor, Chemical '04), silver may become more precious than ever.

When Nadworny began working with Dr. Robert Burrell in 2004, she was completing her undergraduate degree in the Department of Chemical and Materials Engineering.





Her first project with Dr. Burrell was testing Acticoat, a dressing that uses nanocrystalline silver particles for healing and has both anti-inflammatory and antimicrobial properties. By heat treating Acticoat and then testing its antimicrobial efficacy, she found the heat-treated dressing did not work. But why?

The heat-treated silver crystals had increased in size dramatically, from less than 14 nanometres to more than 100 nanometres. The smaller, more fragmented crystals were more effective at killing bacteria than the larger, more uniform crystals.

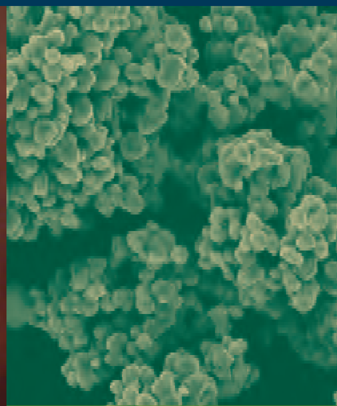
At just 22, she is a PhD candidate in chemical and biomedical engineering. Building on the known properties of nanocrystalline silver, Nadworny hopes to treat lung inflammation disorders such as acute respiratory disease syndrome by focusing her research on creating an aerosol form of nanocrystalline silver.

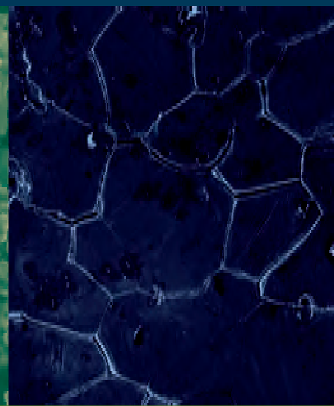
"My goal is to develop a carrier with as few side effects as possible for the patient. With immediate access to the lung tissue and the blood stream, the effect of the nanocrystalline silver would be rapid," says Nadworny.

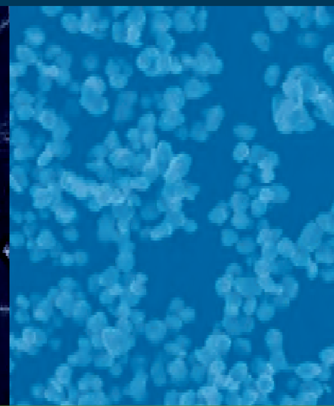
Dr. Burrell recognizes and encourages Nadworny's determination. He describes her as "precious," not unlike the noble metals he studies. "Patricia has many incredible skills. She is very focused and determined. I have no doubt she will be successful," says Burrell.

The soft-spoken Nadworny has already presented her research at several major conferences, has been published twice, and created a course module for the Department of Mathematical Biology. She also has a long list of awards and scholarships.

Nadworny deserves a gold medal for her silver research.







The Mackiw Lectures in Metallurgy

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The Mackiw Lectures in Metallurgy endowment fund was established in 2002 in memory of Dr. Vladimir N. Mackiw, a distinguished scientist, inventor, and industrialist who specialized in extractive metallurgy, hydrometallurgy, and powder metallurgy. The lecture series brings world-class metallurgical speakers to the University of Alberta campus.

Your contribution to this fund will inspire our students and Faculty to achieve all they possibly can and create a culture of collaboration with other universities, research institutes, and industry partners. The Mackiw Lectures in Metallurgy will also enhance the already internationally-renowned reputation of our Department of Chemical and Materials Engineering.

Help support tomorrow's chemical and materials engineers.

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