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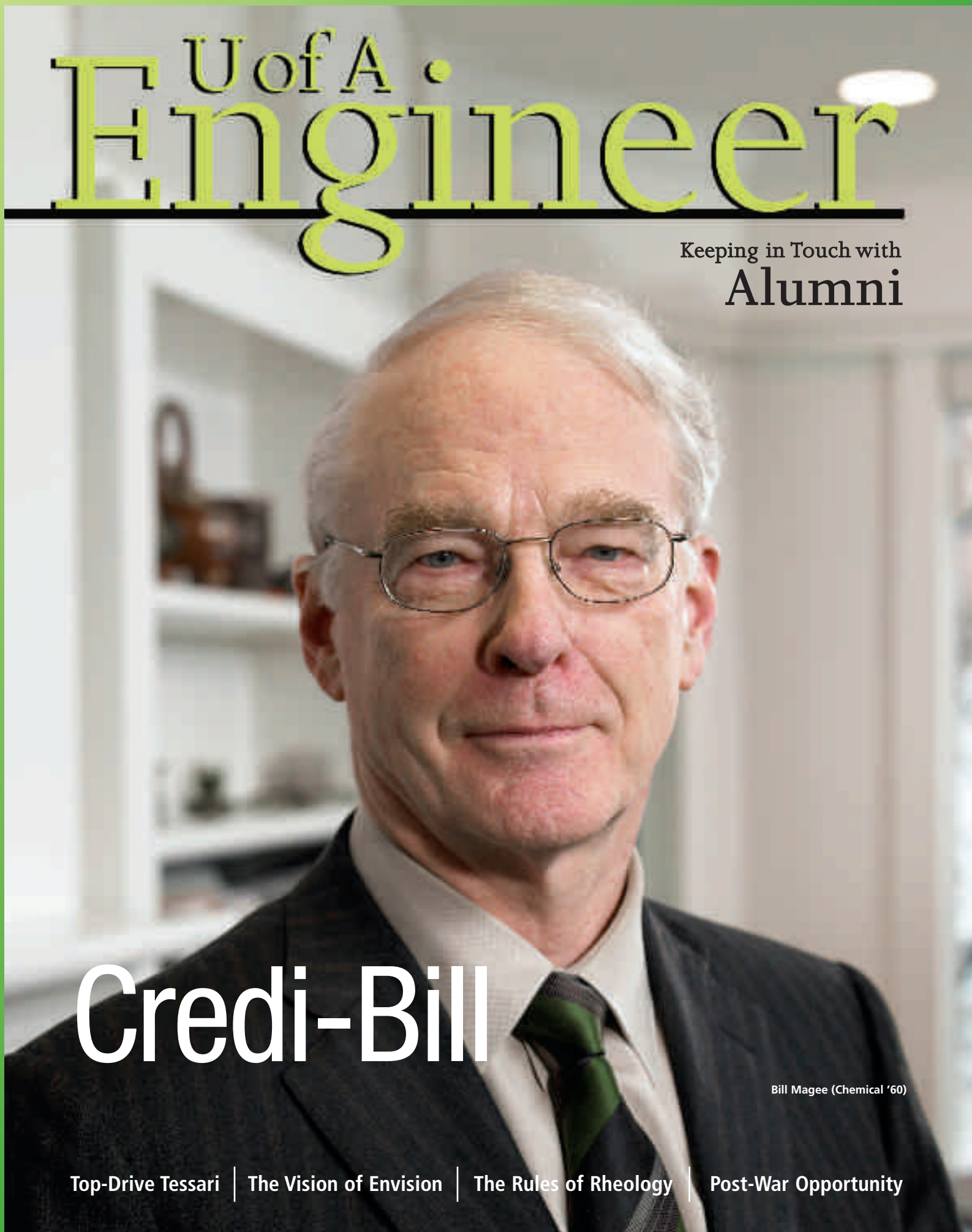
U of A Engineer

Keeping in Touch with
Alumni



Credi-Bill

Bill Magee (Chemical '60)

Top-Drive Tessari | The Vision of Envision | The Rules of Rheology | Post-War Opportunity

Message from the Assistant Dean

Whenever U of A Engineers gather and reminisce about their days at university, it doesn't take long before they begin to share memories of the professors who taught, encouraged, and sometimes gave them a little kick to become better engineers. Whether it was clear at the time or not, your professors were there to help you become not only university graduates, but also competent professionals in a field that is so vital to the functioning of our society.

Think back to your favourite professor—what was it that made him or her special? Was it a dry wit that made even the most tedious of technical material bearable? Was it a way of clearly explaining and re-explaining complex concepts without making you feel foolish for not understanding the first time? Or was it a passion for their particular engineering specialty that was somehow contagious?

The Faculty of Engineering needs to hire even more of these special professors who have such a significant impact on the lives and careers of our students. While our current faculty size is at a record high of 165, the demand for our programs continues to grow at an amazing rate. To accommodate this growth and allow for other transitions such as retirement, we will need to fill 100 new faculty positions with outstanding educators at the assistant, associate, and full professor levels in all engineering disciplines over the next several years.

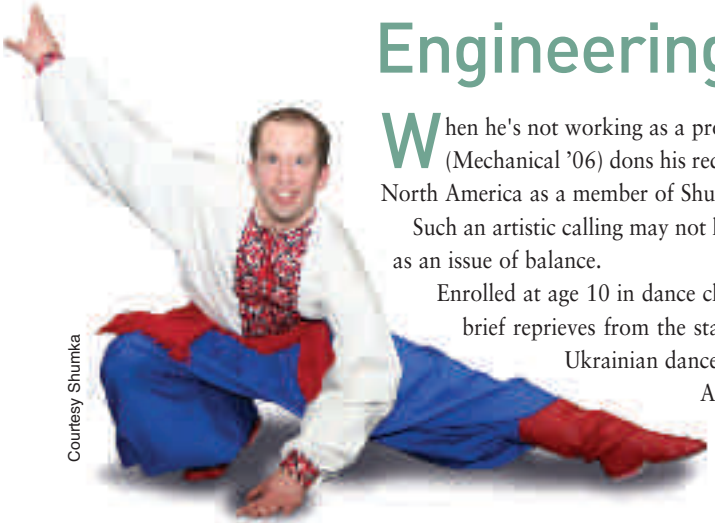
These new faculty members will help us continue to focus on the advancement of our scholarship and research efforts in four major areas: nanotechnology and interfacial engineering, energy and natural resources engineering, biomedical and bioengineering, and information and communications technologies. Our academics work in an integrated, collaborative environment, where a strong science focus is combined with valuable industrial ties and ample opportunity for novel collaborations. The best candidates for our 100 positions will be those individuals with interdisciplinary experience, as well as those who have combined their engineering background with work in the physical and life sciences or medicine.

You can help ensure that the engineers of tomorrow continue to benefit from the knowledge, mentorship, and leadership that outstanding professors provide. As an alumnus and advocate of the Faculty of Engineering, you can continue to talk about your alma mater with pride, knowing that it is considered one of the top engineering schools in Canada, North America, and the world. You can bring opportunities for applied research through the companies you have founded or for which you work. You can also encourage your organizations to give philanthropic support to the Faculty of Engineering in areas of chairs and professorships, which the Government of Alberta has committed to match through the Access to the Future Fund. Our industry partnerships are incredibly valuable to us, and help attract qualified educators and researchers from around the world.

Corporate and alumni partners play a vital role in the growth and success of your Faculty of Engineering. Please feel free to contact me at any time if you would like to explore ways in which you or your organization can help build and enhance the intellectual capacity of our school. For your support and collaboration, our sincere thanks.

Yours truly,
David M. Petis
Assistant Dean
External Relations

NEW to www.engineering.ualberta.ca



Courtesy Shumka

Engineering Performance by Bev Betkowski

When he's not working as a proud new recruit for the Schlumberger Edmonton Product Centre, Ryan Blush (Mechanical '06) dons his red leather boots and steps well outside the box, whirling around stages all over North America as a member of Shumka, one of Canada's premier Ukrainian dance groups.

Such an artistic calling may not have much to do with a nuts and bolts career in engineering, but Blush sees it as an issue of balance.

Enrolled at age 10 in dance classes by parents who wanted him to know his culture, Blush has taken only brief reprieves from the stage. He's always lured back by the pure passion and exuberance that define Ukrainian dance.

And a word for the still-skeptical: the phenomenon of the dancing engineer is on the rise. Blush knows four fellow dancers who are also studying engineering at the U of A.

To read the complete article, log on to www.engineering.ualberta.ca.

Table of Contents

Winter 2007


18


6

COVER STORY

FEATURES


30

DEPARTMENTS

Message from the Editor

In this edition of "Crosshairs on History" we survey the history of Alberta, the history of the Faculty of Engineering, and the many contributions U of A professors and engineers have made to the province and the nation from 1909 to present. This is part two of a chronology. In the fall issue of *U of A Engineer*, we covered people and events that shaped engineering to 1958. Part one of "Engineering Over the Decades" generated some impassioned feedback from alumni. Many of you contacted me to mention a favourite professor who had been omitted. Certainly, no compendium is exhaustive. Sincere efforts were made to cover the highlights. Space was a factor. However, I enjoyed hearing your suggestions and loved your feedback. I hope and expect part two will generate equal interest.

Parts one and two of "Engineering Over the Decades" sprang from speech notes that Dean Lynch delivered to the Dean's Brunch, part of Reunion Weekend activities. Alumni enjoy Dr. Lynch's informative overview and frequently ask for copies of Lynch's speech. The two articles (in this magazine and the last) are a partial response to such requests.

Please feel free to comment on any and all of the content in this winter issue of the magazine. Feedback is always welcome. Contact me at 780.492.4514 or at sherrell.steele@ualberta.ca

Yours truly,

Sherrell Steele

Sherrell Steele
Communications and Public Relations Strategist
Faculty of Engineering

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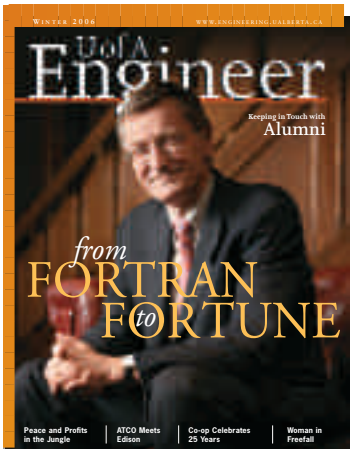
Dear Editor:



I was reading and enjoying the article on the Sissons of Medicine Hat (winter 2006 issue of *U of A Engineer*) when I stumbled over a sentence that did not quite make sense to me. It reads: "Gordon recalls one adventure 65 years ago, when his class went with Professor Webb to build dams near Banff."

My father, Professor Harry Webb (Civil '21) was in the habit of taking his students on some trips so they could see the real thing. One of the trips was to see Grand Coulee Dam on the Columbia River in Washington State, and the one mentioned in the article would have been to see the dam built by Calgary Power at Lake Minnewanka (near Banff). My dad had been resident engineer on that project during the preceding summer.

Few of those students are still living, so maybe no one but me will notice the error.

Sincerely,
E. Virginia MacKay, PEng (Civil '48)

errors and omissions

There is an error on page 39 of the fall 2006 issue of *U of A Engineer*. Larry Staples (Civil '74) is no longer with Acuren Group Inc. He is currently the president of C-FER Technologies in Edmonton.

Engineering Generations Wall

On May 17, 2006 the Faculty of Engineering unveiled the Engineering Generations Wall. The wall is located outside the Solarium and on pedway level, south of the Engineering Teaching and Learning Complex. The wall lists multiple generations of U of A Engineers and illustrates family connections to the Faculty. It celebrates those who set an Engineering path that their children or grandchildren, siblings, or cousins followed. As well, it recognizes those families who got their start here in Engineering—the students who met and married here in the Faculty; several of these groups now have children who are also Engineering students or alumni. There are more than 510 individual names on this wall from more than 170 families.

An Engineering father-daughter connection: Marta Dmytruk (Civil '97) and Chrys. Dmytruk (Chemical '60)

Alumni responded most enthusiastically to this installation.

"I think it is great that this recognition wall is going up and I hope to see one of my kids on that wall one day." ANDREW CHAN (Mechanical '87)

"It looks great and I'm really excited and honoured that U of A is doing this to recognize Engineering families. Thank you." CHAD MIELKE (Mining '04)

"Thanks for implementing this program; it's a great idea."
DR. LAWRENCE BORLE (Electrical '82, MSc Electrical '91)

"Thank you for the opportunity to participate in the Generations Family Tree."
ALVIN W. BORLE (Electrical '85)

"I think overall the project is an excellent idea and (I) am pleased to be included."
NATHAN ESHPETER (Mechanical '02)

"I really like your concept of an Engineering family tree. It will be interesting to see how many more branches this tree will grow over the years to come."
HERB ZIEGLER (Mechanical '81)

"I think it is great what you are doing and we hope to add some future generations as well. Keep up the good work." MARK SKOWORODKO (Civil '05)

Mentorship and leading by example have played an important role in the Faculty's history. Every year, new families will be added, and additions will be made to current family groups. In this way, alumni can take credit for having contributed to the growth in the Faculty of Engineering and the success of students.

The Vision for Envisio

by Debby Waldman

In Alberta's booming economy, small start-up companies face stiff competition. But **GERARD MONAGHAN** (Chemical '89) is confident that his industry experience will help Envision Technologies succeed.

Gerard Monoghan (Chemical '89)

Envision Technologies is Monaghan's answer to resolving upgrading issues. Envision now has seven employees including Monaghan as CEO, and he recently incorporated a spin-off company, ETX Systems.

Envision's first shareholders were Monaghan's brother and his cousin, who put up enough money to keep the company afloat until consulting jobs began to come in. ETX now must raise roughly $30 million to get its signature product, the ETX Upgrader, up and running.

Monaghan isn't worried.

"We certainly are doing the right thing at the right time," he says.

"The macro environment for heavy oil has never been better than it is now, and there's a lot of appetite in Alberta for this type of investment."

ETX raised $2.5 million in the first round of funding for the Upgrader. As the supply of light oil decreases and the world grows more reliant on heavy oil from sources such as the oil sands, the coking process is increasingly necessary. Envision's Upgrader, which should make the process more efficient, is still in the design stage.

Monaghan expects that by July of this year the company will be able to start up its feed pumps and commission its one-barrel-a-day pilot project at the National Centre for Upgrading Technology in Devon, Alberta. Two years from now, he expects to have a 500-barrel-a-day demonstration project up and running. Monaghan has set a 36-month goal to produce results that will convince companies to adopt the technology.

Academic rigour is important at Envision. The company often relies on academic consultants like U of A Chemical Engineering professors Dr. William McCaffrey and Dr. Murray Gray.

Monaghan first became aware of McCaffrey and Gray when he was at Syncrude and read about a novel process they'd developed to process bitumen—spreading it out as a thin film and heating it up quickly to decrease the coke yield. When Monaghan immersed himself in academic journals after starting Envision, those two names kept coming up.

"We didn't want to reinvent the wheel, so we started with an exhaustive search of the public domain," Monaghan explains.

"When it comes to heavy oil upgrading, if you search the public domain, the U of A figures heavily in the results of those searches."

Monaghan contacted McCaffrey and Gray, who are generous about sharing their expertise. Two years ago, Envision provided funds for a student in McCaffrey's lab to determine the possible benefits of using the ETX

A diagram of the pilot version of the ETX reactor technology

Upgrader. When new research is published, Monaghan or Wayne Brown, Envision's chief operating officer, will call one of the professors and ask his opinion. The professors have also been helpful as unbiased evaluators who offer feedback when the company reaches milestones.

Of course, it's one thing to make something work in a highly controlled laboratory environment; it's quite another to get it to work reliably in the field, day in and day out. Monaghan knows that. That's why Envision has put its many other ideas on hold for now and is concentrating its energies on the ETX Upgrader.

Heavy oil contains molecules that are much larger and more complex than those found in motor-vehicle gas tanks. The problem is that getting heavy oil to the transportation-grade fuel stage requires breaking down those molecules. Coking refers to the thermal conversion process that cracks the bonds of the big molecules to produce smaller ones. It also reshuffles the hydrogen from the big molecules to stabilize the smaller ones.

What's left after the process is coke—a hydrogen-deficient substance that's highly condensed, almost as dense as coal. Monaghan calls it "a low-value by-product" while others call it junk. The ETX system is designed to produce less coke and more fuel than existing technology.

Monaghan has no illusions that the world's oil-and-gas companies are going to abandon current equipment. As new facilities are built, however, the newest, most efficient technology will be purchased.

"All companies have expansion plans," he says.

"They will need to support much higher throughputs than what they currently produce. I certainly see companies like Syncrude, Suncor, and Canadian National Resources Ltd. being customers of ours."

At Syncrude, Monaghan performed a wide range of tasks, in engineering design as well as technical services. He spent a year in the field doing shift-work, turning valves along with plant operators. The latter wasn't exactly what he was educated for at the U of A but, he says, "it was a valuable experience to try and figure out what we should be incorporating into the design to make it practical for the field."

Syncrude provided Monaghan with other excellent opportunities, including the chance to earn his MBA from the U of A.

"It's nice to be able to know how to design things. But to determine if there's a need, it's useful to have an appreciation of the business fundamentals," he says.

"To a certain extent, business has always interested me. But it also provided a key complement to my engineering skills, and that's helping to move engineering ideas beyond what's interesting to what's actually economic."

> ". . . by 2030, the world will need roughly 15 million barrels a day of heavy oil. Right now it uses about five million barrels a day."

Syncrude also whetted Monaghan's appetite for research and development, when it sent him to New Jersey to work with a thermal conversion research group at Exxon. He spent nearly two years there, helping develop upgrading technology and writing patent applications. The experience opened his eyes to what's possible when working for a multinational company with seemingly unlimited resources.

He had been thinking for some time about what it would take to optimize heavy oil, to make the process more efficient.

"When I saw the type of resources and what a company like Exxon can bring to bear on those problems, I wasn't afraid of doing that through a venture," he says.

"The New Jersey experience gave me the confidence that I could try and do something like that on my own."

Within six months of returning to Fort McMurray, Monaghan left Syncrude, moved his wife and two young daughters to Calgary, and started his company.

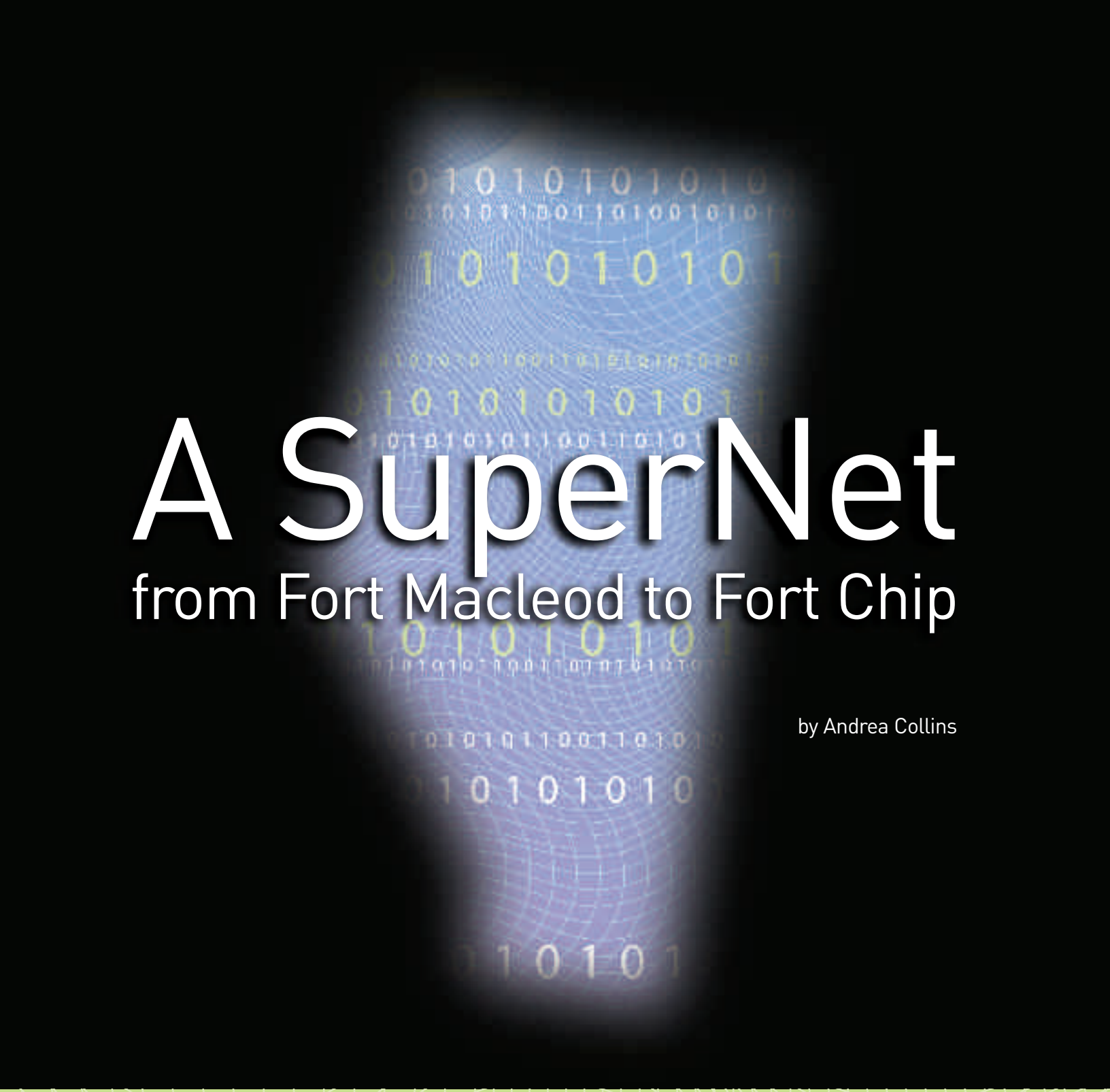
"There is competition," he says, "but we come close enough to that ideal coking process that we believe the chance of a competing technology coming in and surprising us with a totally innovative approach to the process is small. We keep track of the competitors out there, and we're confident."

Monaghan says that by 2030, the world will need roughly 15 million barrels a day of heavy oil. Right now it uses about five million barrels a day.

"We're presenting investors with the opportunity to put their money in, and if our investment pays off, they're looking at a 100-fold or 1,000-fold return on their investment.

"If a person has capital to wager, the upside of this is so compelling, and if you look at the rigour of our development process, and the return we've found there, there's a huge interest in getting involved."

Debby Waldman is an Edmonton-based freelance journalist.



A SuperNet

from Fort Macleod to Fort Chip

by Andrea Collins

In the fall of 2005, Alberta became a lot smaller—virtually speaking. Alberta SuperNet was completed in September 30, 2005, linking every Albertan community in a single immense telecommunications system.

SuperNet spans more than 12,000 kilometres (the distance from Calgary to Auckland, New Zealand), using both fibre and wireless technology. It provides high-speed broadband connections among 4,200 government, healthcare, library, and education facilities in 429 Alberta communities. It also enables the delivery of broadband services by private Internet service providers to rural business and residential customers.

This levels the playing field between Alberta's urban centres and remote communities. Rural business owners can now reach the global marketplace. School children can link up to distance education opportunities. Government departments can provide information and services at the touch of a mouse. Physicians can consult with specialists in the city and receive massive x-ray or other diagnostic images via a private network.

The Alberta government invested $193 million to fund SuperNet's development. Partner Bell Canada contributed more than $102 million to construct the infrastructure and connections in the 27 urban centres, and

Axia NetMedia Corporation of Calgary is contracted to provide network access services, which can be purchased at low cost by Internet service providers. Though it required a large government investment, this public-private partnership system is expected to be sustainable and expandable.

John Luk (Computer '85) was among the many government engineers and IT people involved in the project. His 12-person technical team helped convert government offices from the plodding uncertainty of traditional rural network connections to the high-speed efficiency of SuperNet.

"It's been operational for a some time now and has gone through the weather challenges of every season without problems. We only hope people will take full advantage of it."

"My team travelled to 450 communities in four months," says Luk.

"They were on the road constantly from May to October 2005 and went to some unusual places, communities they likely would not have ever seen if not for this project. A few said it was particularly meaningful to have had this experience during Alberta's centennial."

Although the team had to scramble to meet the project deadline (and win their race with winter weather), they greatly enjoyed the technical challenges posed by this Herculean task.

"For IT people like myself, it was an opportunity to deploy applications we couldn't display before," says Luk.

Luk came to Canada from Hong Kong in 1980, specifically to pursue the U of A's new program in Computer Engineering. On graduation he was hired by the provincial government and has been a player in two major network conversions—the move from X.25 protocol to Frame Relay protocol in the late 80s, and now SuperNet.

Since completing the SuperNet conversion last fall, Luk was named manager of Net Tech Planning. This means his network team will continue to work with Axia on operations, and look at new uses and expanded capacity for the future.

"The system was designed to be scalable, so it can continue to grow as we leverage new opportunities," says Luk.

While Luk and his team worked on the government systems, other engineers were engaged in building massive network connections across Alberta. Morrison Hershfield Limited, a Calgary-based engineering management firm, was subcontracted by Bell to construct much of the infrastructure for rural and remote communities. They employed civil engineers to lay down the fibre optics for the network and build the relay stations. As with many remote projects, the bulk of the work was performed in severe weather, to take advantage of winter roads across frozen lakes and rivers.

Morrison Hershfeld subcontracted Planetworks Consulting Corporation to complete the design work for the radio paths to remote communities. Two U of A graduates, Jack McMullen (Electrical '62), based in Calgary, and Duncan Sharp (Electrical '72) in Vancouver were principal designers of the wireless portion of SuperNet. Their work began in 2002 with a long connection between Rocky Mountain House and Shunda (Baldy) Mountain near Nordegg. Their last wireless connection, completed in April 2005, linked northeast Alberta from Fort Vermilion to Garden Creek (Wood Buffalo National Park) as well as south to two communities of Tall Cree First Nations.

However, it was their work in the far north that made engineering history. Their 120-kilometre wireless connection from Fort Chipewyan to a promontory in the Birch Mountains is believed to be the longest broadband wireless span in North America—possibly the world. It won Morrison Hershfield two awards of merit in the 2005 Consulting Engineers of Alberta Showcase Awards.

High capacity wireless connections were needed to link Fort Chip's two hospitals to urban diagnostic centers. A short connection

was out of the question, because the town lies on the edge of Wood Buffalo National Park and construction within the park is prohibited. Outside the park, environmentally sensitive marshlands are a breeding ground for whooping cranes, bison, and other threatened species. Even if the environmental concerns were ignored, the ground is too soggy to efficiently install and maintain fibre.

The connection needed to bypass the park, cross Lake Athabasca, and avoid oil sands activity and Precambrian Shield land near town.

"We evaluated six design solutions and carefully weighed the risks and benefits of each before deciding on the long microwave shot," said Sharp.

"We had our final path calculations reviewed by others—an engineering professor at Simon Fraser University, an engineer with Northwestel, and another consulting engineer—before we proceeded. The solution we favoured, and eventually used, had the highest risk, but it looked like the risk was worth it. It was the cheapest and fastest shot."

It was proposed that the high-frequency band run parallel to an existing Telus microwave—a narrow, low-frequency band—which gave them an electronic path to follow. The new wireless path needed to be stable enough to be usable and have enough fade margins to prevent static and break-ups.

"Our boogeyman was dispersive fading [selective fading within the band]," said McMullen. (Dispersive fading is caused by fluctuations of radio signals resulting from variations in the transmission medium.)

They decided to use a long-distance microwave system made by Alcatel in Texas. Known as a quad diversity system, it connects at each site and employs four different receivers: two for the space diversity offered by the double antennas, and another two for the frequency diversity offered by two signals carrying identical information on separate frequencies. McMullen and a colleague from Bell travelled to Texas to witness system testing of the quad diversity algorithms for use in the Fort Chip link. The system was successfully installed in February 2004 and activated that June.

"It could have been a great success or a great failure," said McMullen.

"It's been operational for a some time now, and has gone through the weather challenges of every season without problems. We only hope people will take full advantage of it."

SuperNet training across the province played a big part in bringing health care, education, library, and government users up to speed. The system is now becoming available for residential and business use through Internet providers. Those users receive training and certification at Axia's not-for-profit NEWT lab (Network for Emerging Wireless Technologies) in Calgary, a leading wireless technical center that provides both hardware and software development and testing support.

SuperNet has provided for all seven layers on the standard Open System Interconnection model of networking to be operational in Alberta, not only in major urban centres, but across the province. It has brought the capacity for high-speed access to more than 86 percent of Alberta's population, making it a key factor in rural Alberta's social and economic development.

For the medical community, it means bypassing an eight-hour helicopter ride or three-hour narrowband modem transmission to send and receive vital medical information. It can also be used for training workers for Alberta's booming oil and gas industry; vocational schools in Calgary and Edmonton can offer long-distance instruction in welding and other needed trades. As for business, Tokyo will be as close as Tofield for e-commerce transactions.

The government of Alberta developed the vision for SuperNet beginning with an Information and Communications Technology Strategy in 1998. It set the stage for Alberta to move aggressively forward in this telecommunications frontier.

"Alberta is farsighted," said Sharp.

"Telecom is an enabler—we were the leader in installing underground phone lines and extended area service many years ago, and now we are one of the most wired jurisdictions in North America.

"Some critics say SuperNet is overkill. I disagree. We have built a system in answer to today's needs, but it has the capacity to serve us well into the future."

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

The Rules of RHEOLO

Many say the late **DR. ARTHUR B. METZNER** (Chemical '48) led the way in the development of rheology as an important field of applied science and in the use of rheology for the rational design and analysis of manufacturing processes.

by Bronwen Strembiski

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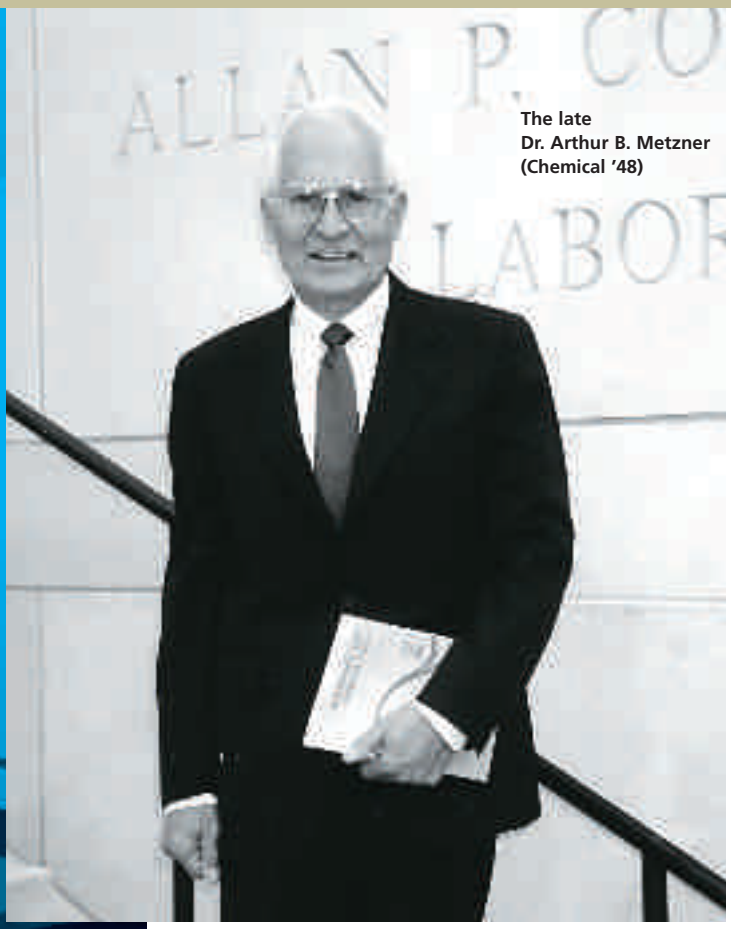


The late
Dr. Arthur B. Metzner
(Chemical '48)

Metzner was not only recognized for his academic achievements and research contributions, but also for his volunteer commitments and his overall positive spirit. Even after he had retired for the second time, people still came to him for professional advice, keeping him active until his death.

"Art had an unremitting commitment to excellence, coupled with extraordinary warmth, humour and generosity," reflects Morton M. Denn, Albert Einstein Professor and director of the Benjamin Levich Institute for Physico-Chemical Hydrodynamics, City College of New York.

Born in Saskatchewan, Metzner lived much of his life in Alberta before moving to the United States. After he received his undergraduate degree, he earned his doctorate from the Massachusetts Institute of Technology in 1951.

Metzner began his academic career with instructorships at MIT and Brooklyn Polytechnic Institute. In 1953, he joined the University of Delaware as an assistant professor, becoming an associate professor in 1956 and a professor in 1961. He was named the H. Fletcher Brown Professor of chemical engineer-

He described his research interests as processing of composite materials, polymer processing, fibre spinning, and fluid mechanics. In fact, though, his work was much broader. His name is associated with the rheology of non-Newtonian fluids, and as such he was the editor of the *Journal of Rheology* from 1985 to 1995.

ing in 1961, and then, in 1991, the H. Fletcher Brown Professor Emeritus, a title he held until his death.

Metzner clearly understood that teaching chemical engineering was not so much about content but more about helping students to have the skills and confidence to be able to solve a wide range of problems. He encouraged students to participate in a variety of ways, mostly by explaining how they completed the many problems he assigned. It was very dangerous to come to class unprepared.

Metzner wanted the students to learn to solve specific problems on their own. His approach made them more attentive readers of textbooks, and ultimately, more confident engineers.

He also had a unique approach to teaching the graduate fluid mechanics course. He emphasized students' ability to critically examine papers in the literature and develop a different approach to a specific issue if the papers were found lacking.

"Art mentored many students both in the classroom and in his laboratories," remarks Dr. T.W. Fraser Russell, Allan P. Colburn Professor of Chemical Engineering, University of Delaware.

"He had a positive influence on their careers. Several have become leaders in either the academic and industrial world."

As a research advisor, Metzner directed 48 Bachelor theses, 46 Masters, and 38 PhDs. He acted as a mentor at the beginning of each project, but as the work progressed, he encouraged (perhaps demanded) independent thought and insight. He kept track of these students after they graduated, and he was a gifted and conscientious letter writer. Whenever a former student was promoted, Metzner would send an incisive and instructive congratulatory note; the recipient felt truly honoured.

Metzner was a skilled and subtle leader. In a university, great leaders note the strengths of their subordinates and make suggestions for improved results. However, Metzner had high standards, and found bloodless ways of getting rid of those he judged inadequate. A correctly written letter of recommendation would help an underachieving faculty member transfer to another institution, or a fatherly talk about career choices would help another move on entirely.

The world of engineering was built by many great people. But when it comes to the study of rheology there are few, if any, as great as Metzner.

He described his research interests as processing of composite materials, polymer processing, fibre spinning, and fluid mechanics. In fact, though, his work was much broader. His name is associated with the rheology of non-Newtonian fluids, and as such he was the editor of the *Journal of Rheology* from 1985 to 1995. There, he established standards that resulted in the highest Institute for Scientific Information Impact Factor of any research journal in rheology, fluid mechanics, or polymer processing. For these efforts he was given the distinguished service award by the Society of Rheology in 1997.

Rheological research combines many fields, including biophysics, chemical engineering, chemistry, computer science, electronics, engineering mechanics, materials science, mathematics, and mechanical engineering. Metzner's comprehensive overview of rheology and chemical engineering allowed him to connect rheology with many other related fields, an ability shared by few others.

Metzner's primary research was in the areas of fluid mechanics, heat transfer, and the processing of polymers and composites. He produced approximately 130 research publications and patents, earning awards from the American Institute of Chemical Engineers, the Society of Rheology, the American Society for Engineering Education, and the American Chemical Society.

Extending his expertise outside of the University of Delaware, Metzner was a member of the external visiting committee for Chemical Engineering at Princeton University, Massachusetts Institute of Technology, Pennsylvania State University, and McGill University. When the U of A's Chemical Engineering program was under review, Metzner served on the advisory council. After interviewing faculty and students, he put together a report detailing the results of his interviews and outlining recommendations.

Metzner enjoyed an active consulting practice, and the research stemming from these efforts often became textbook material. Examples include the Otto-Metzner correlation for power consumption in the mixing of non-Newtonian fluids, his series of papers on drag reduction with the use of small quantities of viscoelastic fluids, and his analysis of the flow of fibre suspension, including a landmark paper on the extensional viscosity of fibre suspensions.

In the late 90s, when the transfer of oil from the Prudhoe Bay field was severely reduced, the Alyeska Pipeline Service company hired Metzner as a consultant to review their operations. He gathered a group of

experts who ultimately made strategic reductions in the number of pumping stations and made use of drag reduction insights.

Proposing a design problem, Metzner brought this accumulated knowledge from the Alyeska project to the undergraduates in the first chemical engineering laboratory course. The students soon found out that the operation of a pipeline was much more complex than the operation of the pipe rack in the laboratory. Their problem was to specify the location of pumping stations from Prudhoe Bay to Valdez. To solve the problem, students had to digest a large quantity of literature, understand fluid flow in a partially filled pipe operating with major changes in elevation, and, finally, consult the master, Metzner. This is an example of problem-based learning at its best.

As a consultant, Metzner brought remarkable insight to companies such as Mobil, Dow Chemical, and Union Carbide. He not only offered technical advice, but also interacted with management for the timely execution of projects.

With studies in the areas of the processing of composite materials, polymer processing, fibre spinning, and fluid mechanics, he has had an enormous impact on practice. He was substantially involved in significant governmental associations, including the Defence Research Board of Canada and the Canadian Defence Research Establishment.

Genuinely humble about his awards, Metzner always shared in his success with family, friends and, most importantly, fellow team members.

"There were very few associates over the years, both in academia and industry, who were not important mentors to me," he once said.

"And, as the years went by, older mentors were replaced with equally important younger associates. The young mentors in the last decade of my career were no less important than the older people of the first."

"He was obviously very bright but also had great insight," says Dr. Ken Porteous, Associate Dean (Student and Co-op Services), Faculty of Engineering.

"This allowed him to develop simple but elegant experimental and theoretical treatments to demonstrate a principle. His work was of the highest quality and he expected no less from those who worked with him."

On the 40th anniversary of his employment at the University of Delaware, Metzner received more than 80 letters of congratulations, praise, and thanks. The university presented him with a memory book of these messages during a symposium held in his honour.

No small tribute to a man who knew the rules of rheology but was never ruled by them.

Bronwen Strembiski is an Edmonton-based motivational speaker and public relations consultant.

Editor's Note: **The above images were taken during Metzner's 40th anniversary of employment at the University of Delaware.**

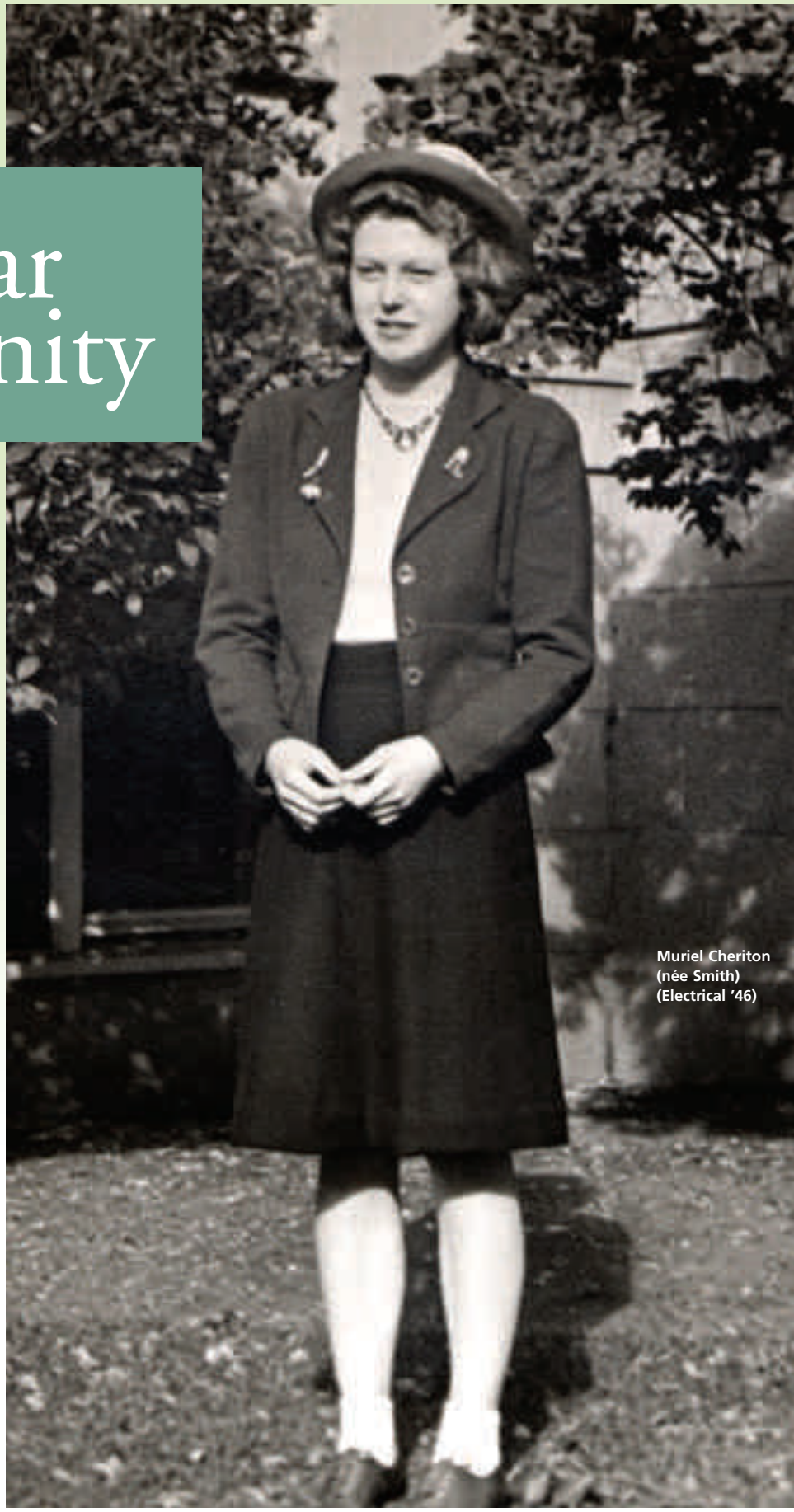
What is RHEOLOGY?

Rheology is the study of the flow of materials that behave in interesting or unusual manners, and mainly describes the material properties of fluid and semi-solid materials. Rheological descriptions usually refer to the property of viscosity (how thick a fluid is) and departures from Newton's law of viscosity. Rheology combines, to an unusual degree, academic activities with the possibility of practical applications in a wide range of industrial situations. These include commercial processing of plastics and rubber, textiles, paper, oil and paints, foodstuffs, adhesives, and composites.

Post-War Opportunity

The only certainty about war is its uncertainty. For Muriel Cheriton (née Smith) (Electrical '46), World War II created an unexpected opportunity and then, a few years later, a closed door.

by Andrea Collins



Muriel Cheriton (née Smith) (Electrical '46)

The parents of this young Edmonton woman were both schoolteachers, and Cheriton hoped to follow in their footsteps. In 1942, high school transcript and savings in hand, she tried to enrol in education at the University of Alberta. When she discovered that she was short of funds for tuition, she turned sadly away to head home.

A woman in the registrar's office stopped her. She had seen Cheriton's high marks in math and science, and knew that there was a high demand for scientists in wartime. The University offered inducements for students entering sciences (resulting in a record high of 183 accepted into first-year Engineering in 1942). Cheriton was one of the lucky ones—she was eligible for a bursary offered to women in science. She jumped at the chance.

Though another woman started the fall term with her, she soon dropped out. So, Cheriton was the sole female in the Faculty until Virginia Webb enrolled in 1944.

Cheriton had no problem mixing with her male classmates.

"I grew up with brothers, so they were just like another bunch of brothers. I got teased a lot, but I was treated like a lady. However, I made sure to make myself scarce when there was a stag going on!"

Cheriton chose electrical engineering because of a personal interest in radio. It was also a high priority for the Canadian government. U of A was providing special short courses in electronics for navy and air personnel, as well as regular engineering classes.

Classes ran for ten hours a day with another four hours on Saturday. Every student was also required to donate four to six hours to volunteer work to assist the war effort. Cheriton washed test tubes at the blood donor clinic, learned Morse code, and assembled information on poisonous gases. Homework, study, and special projects filled much of the remaining hours.

"We all worked very hard," understates Cheriton.

But, somehow, the engineering students of the day still managed to fit in fun. As her class representative on student council, Cheriton was right in the thick of planning social events—including the celebrated Engineers' Ball where, in 1945, she was named the Queen of Engineering.

The Engineering Parade in 1943

Her graduation in 1946 made her the University's second female Engineering grad (Esther Rabkin, Electrical '35, graduated from the Faculty of Applied Science). It also brought her into competition with experienced engineers returning from wartime service.

Fortunately, Cheriton had proven her mettle in a summer job at Calgary Power, and the company offered her full-time work on graduation. While there, she met a person from General Electric who suggested she join the company in Toronto so she could "have more scope in her work."

The year in Toronto brought many new experiences—including meeting Ross Cheriton, whom she married in 1947. Ross was a graduate of electrical engineering at University of Saskatchewan, and the two decided to move back west. In those post-war years, married women were discouraged from employment (to leave jobs free for servicemen), so Cheriton settled into a traditional role of wife, mother, and community volunteer.

However, Cheriton's keen mind was still interested in engineering, and she kept abreast of developments in the sector through reading and her husband's work. Ross started his own firm out of the basement of the family home in Edmonton in 1956, and Cheriton was its self-described "go-fer." As the company grew and got its own office, she became more active, looking after facility rentals, insurance, and financial matters, and occasionally working on engineering projects.

"I came into my own in 1963," she said in an interview that appears in George Ford's book *Sons of Martha*.

"I was working in my profession and making the decisions necessary for the successful operation of the consulting firm."

However, Cheriton says informal discussions with Ross were an even greater help.

"Every time he'd tell me about a challenge or problem with a project, I'd ask him questions and he'd keep working the answers over until he got it right."

She was particularly strong in the forensic engineering (detecting arson or other sources of fire or explosion), which Ross practiced as a sub-specialty.

Cheriton made her own impact on engineering in wider circles as well. She served on the council and a disciplinary committee with the Association of Professional Engineers, Geologists and Geophysicists of Alberta, was active with the Engineers' Wives Association, served on the U of A Engineering "camp" to determine recipients of the famous iron rings, and other organizations. She organized annual meetings, conferences, and social events; chaired committees and sat on boards; and was the organizer of her class for the 2006 Reunion.

"I've never regretted completing my degree, even though I didn't apply it directly to a career," says Cheriton.

"Times were different then, and I enjoyed staying at home to raise a family. I've had a good life.

"But I admire today's young women in engineering who seem to be able to fit family life and work together so well."

No doubt, the pioneering work of women like Cheriton paved their way.

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

Credi-Bill

BY DONNA PAPACOSTA

Life's been good to Bill Magee (Chemical '60). He has experienced a rewarding career (two, actually), international travel and, now, sufficient leisure time to enjoy life. Magee credits much of his success to being in the right place at the right time, but he's being a little too modest. He has put himself firmly in the path of interesting work and professional growth experiences throughout his 46 years since graduation.

After completing his degree at U of A, Magee spent a year in France attending an engineering graduate course at l'École de Génie Atomique in Grenoble, a program that included nuclear reactor design.

Study and work in Europe opened his eyes to different ways of thinking and living.

"Of course we were focused on the job at hand, but couldn't help noticing when we stopped at a French newsstand, that there were 15 different newspapers on display—political

Bill Magee (Chemical '60)

opinion from the extreme left to the far right."

He'd come a long way from Edmonton.

Sitting in his Toronto office, Magee looks back and says, "In many ways our class was very fortunate. The oil business in Alberta boomed during the 1950s. Natural gas ramped up in the 1960s. There was lots of work for engineers when we graduated. And I found in my first few years of operations in the field, where they put the young single guys, that we were well prepared for the job."

After his stint in France, Magee was employed for nine years in process design and project engineering with the Canadian affiliate of Air Liquide, a world leader in cryogenic (very low temperature) gas processing. Based in Montreal, he worked on projects in Canada, the United States, and Europe.

"The fun part was starting up the plants," he recalls.

Magee booted up oxygen plants and hydrogen purification units in Louisiana and in Spain, air separation units in Hamilton and in West Virginia, and two of the world's first liquefied natural gas peak shaving plants in Montreal and in Tennessee.

Magee switched gears somewhat in 1969, when he obtained a diploma in business administration from McGill University.

"I got to the point where I had proven that I could do this job and I thought I might be ready for a new challenge. McGill was just two blocks away from our office, so it was easy to attend their evening courses. I already had an interest in investing, so I thought I would study for a business diploma."

Again, Magee was in the right place at the right time. The Canadian investment industry had just begun to hire people with technical skills to do research and due diligence in the oil, gas, and mining industries. Combining his expertise in two disciplines—engineering and finance—he took the leap into the investment business.

Top: The 2004 Kazakhstan International Oil & Gas Exposition in Almaty, the country's commercial centre in eastern Kazakhstan. This was a week-long event attended by 412 companies from 30 countries.

Bottom: A group of investors inspecting a producing oil well on an exploration licence 50 kilometres east of Aktau, a port city in western Kazakhstan on the Caspian Sea. The licence is held by BMB Munai, an oil company that Credifinance brought public in 2003.

"I liked the idea of being an equity investor in a firm."

Since 1994, Magee has been associated with Credifinance Securities, a small investment bank in Toronto, where he has focused on financing junior oil producers in the former Soviet Union.

> "I've seen it all—soaring commodity prices, changes in the fiscal regime, an explosion in the number of companies, acquisition mania, the shifting focus to the oil sands, international operations, and impressive advances in technology."

One noteworthy success was a Calgary-based junior called Hurricane Hydrocarbons. In 1995 Credifinance raised $5 million to finance Hurricane's initial project in Kazakhstan. After 10 years of exceptional growth and a name change to PetroKazakhstan, the company was sold in 2005 for $5 billion.

Over the past 36 years, Magee has witnessed the rapid growth of Canada's oil and gas industry.

"I've seen it all," he says, "soaring commodity prices, changes in the fiscal regime, an explosion in the number of companies, acquisition mania, the shifting focus to the oil sands, international operations, and impressive advances in technology."

In his work, Magee has visited field operations throughout western Canada, refineries, petrochemical plants, drilling in the Beaufort Sea, and several projects in the oil sands. He has also visited international operations in Dubai, India, Norway, and the Sudan, as well as in the former Soviet Union, Georgia, Kazakhstan, Russia, and the Ukraine.

What advice would Magee offer newly minted engineers?

"I know that those graduating from U of A will have a good grounding on the technical side of engineering," he says.

"Beyond that, they'll have to be willing to live with constant change in the working environment. With all the consolidation going on, as well as accelerating globalization, it's a jungle out there."

Magee also recommends learning languages. In addition to French, he speaks some Spanish, has picked up a little Russian, and regrets not taking the German option at U of A.

"Overall, I'd say to choose work that's fun for you," he advises.

"Find something you enjoy and that you feel is worthwhile."

What's next on the horizon for Magee? He's not packing away his passport.

"We are working on another project in Kazakhstan," he says.

Yes, he will retire someday, but not just yet.

"I am gradually phasing into retirement," he explains.

"I retired as a director three years ago. I have flexible hours here at Credifinance, and I get to do work I find gratifying—following the oil and gas industry and keeping up with the tremendous changes in it."

You get the sense that, even after he retires, Magee will never stop seeking out new experiences.

Donna Papacosta is a writer and editor in Oakville, Ontario. She admires anyone who can learn to speak some Russian.

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Civil Engineering

Rogers, Al (Civil '60)

A slight error was noticed on page 24 of the summer 2006 issue of *U of A Engineer* in the article entitled "Engineering Over The Decades." I think you will find the first oil well in Turner Valley was the Dingman #1, which was completed in May 1914, well in advance of 1936.

Simmonds, Dr. Sid
(Professor emeritus, Civil Engineering)

I enjoyed reading your article on notable people in fall 2006 edition of *U of A Engineer* since I had heard of all of them and knew Karl Clark, Ike Morrison, (LLD [Hon] '53), Bob Hardy, (LLD [Hon] '77) and Len Gads (Civil '39) personally. My reason for writing is to correct a date for the time Len Gads was associate dean. I know that he was associate dean in 1949, but he may have been appointed earlier.

I worked closely with Len during the 1960s, on career days visiting high schools in northern Alberta when he was associate dean and I was chair of the APEGGA Education committee. In 1969, Gads had heart problems and was given health leave, which may be where you got the 1969 date.


Len Gads

Bob Hardy appointed me acting associate dean for Engineering until Len's retirement, and I remained in that position until after George Ford (Civil '42, MSc Civil '46, DSc [Hon] '88) was appointed Dean in 1971. I decided to return to full-time teaching duties in the Civil Engineering department and recommended to Ford that future associate deans be appointed for a limited term. It is interesting to note that today all academic administrative positions are for a limited term, but I take no credit for that.

It is unfortunate that you had such limited space, as both Bob Hardy and Len Gads were colourful characters. You could have filled several pages with the amusing stories their colleagues could tell.

Electrical Engineering

Bath, Duncan (Electrical '45)

Someone will (may) pick up on my letter on page 17 (of the Fall 2006 issue of *U of A Engineeer*. 25 m3s should have been 25 m3/s (25 cubic metres per second).

P.S. Last September, we did get our first look at the Brooks Aqueduct. Well worth the effort. As icing on the cake, a freight train rumbled over the inverted siphon while we were there.

Martin, Kent (Electrical '87)

The article on ET-DSP (page 21 of the fall 2006 issue of *U of A Engineer*) took me back the summer I spent collecting data for the basic principles of this process. I worked as an undergraduate student for Drs. Chute (Electrical '66) and Vermeulen (Electrical '60, PhD Electrical '66) during the summer of my third year of electrical engineering (1986). I wanted to find out if research was my niche. Though I found during that summer that I wanted to work on projects with shorter term results than the basic research, I did learn a lot about the process. Ultimately, I ended up working for Motorola using the training I got in another one of Dr. Chute's passions, radio communications. Though I don't often use a Smith chart anymore, I still surprise myself with the nuggets I remember from those classes.

Sherriff, Eric (Electrical '86)

I am writing in regard to the article on Ross Ulan (Electrical '84) in the Fall 2006 issue of *U of A Engineer*. I found the article interesting, as I used to work with Ross in the Edmonton regional headquarters (at that time it was Transport Canada). While Ross moved on to Ottawa, I stayed in the trenches at the regional headquarters. Ross was a great guy to work with, and we remain in contact. While Ross obviously regards his move to Ottawa as a major turning point in his career, I resisted all offers and advice to head to that particular "mecca."

Mining/Metallurgical

Plitt, Verne (Mining '57, Metallurgical '66)

I enjoyed reading the fall edition of *U of A Engineer.* I commend you on the good work in producing this publication.

I wish to comment on what I believe is an error and an omission in the historical section. It was stated that Karl Clark was a professor in the U of A Civil and Mechanical Departments. In checking *Sons of Martha*, I find that he was only a professor in the Department of Mining and Metallurgy from 1939 to 1954, when he retired. He apparently taught metallurgy courses, specifically metallography. He was also head of that department from 1945 to 1954. In fact, the Mechanical Engineering Department at the U of A was only formed in 1958, four years after Clark retired from the university.

The article mentioned the first engineering professor, Muir Edwards, but makes no mention of the second engineering professor, Allan Cameron, who taught engineering at the U of A from 1914 to 1937.

I appreciate that it is difficult to keep all the historical facts straight. Keep up the good work.

Top-Tessa

The high costs of doing business in Alberta's oil patch often oblige company executives to be conservative decision makers when assessing new technology. Innovators who try to pitch new ideas and products sometimes encounter significant hurdles.

But to every rule there is an exception. Consider Robert Tessari (Chemical '73), a persistent engineer who not only developed a trailblazing technology for coaxing oil from the ground, but was also able to raise $90 million over three years to bring his idea to market.

Tessari is the founder of Tesco Corp., a large and profitable oil field services company which today boasts annual revenues of $200 million and a market capitalization of about $800 million. Despite the initial reluctance of his target market, many of these "show me" skeptics ultimately yielded to the undeniable truth: Tesco's portable top-drive drilling system is not only efficient and easy to use, it's as much as 20 percent cheaper to operate than more traditional set-ups.

"We were like thousands of other people who said, 'We're going to build a better drilling rig,'" Tessari remarks today.

But he neglects to add one critically important difference: he and his talented support team of machinists, mechanics, rig rats, and roughnecks actually pulled it off.

"I had a great deal of help from day one. These were dedicated people who really believed in what we were doing."

Tessari's pursuit of success within international drilling fields is an inspirational tale guaranteed to warm the heart of every would-be product developer or frustrated inventor.

Tessari spent years in his lab and workshop. He put the arm on dozens of patient friends, relatives, and casual acquaintances, trying to scrape up enough cash to finance his research. He lost sleep and, occasionally, lost faith (if only temporarily). But his passion paid dividends in the end, a triumph symbolized by an important photograph on his office wall. It's a picture of an Ensign drilling rig, put in place near Lloydminster by Tessari and his colleagues, under contract for Lasmo Oil. Beneath the photo is inscribed: "World's first portable top-drive installation. July 21, 1992."

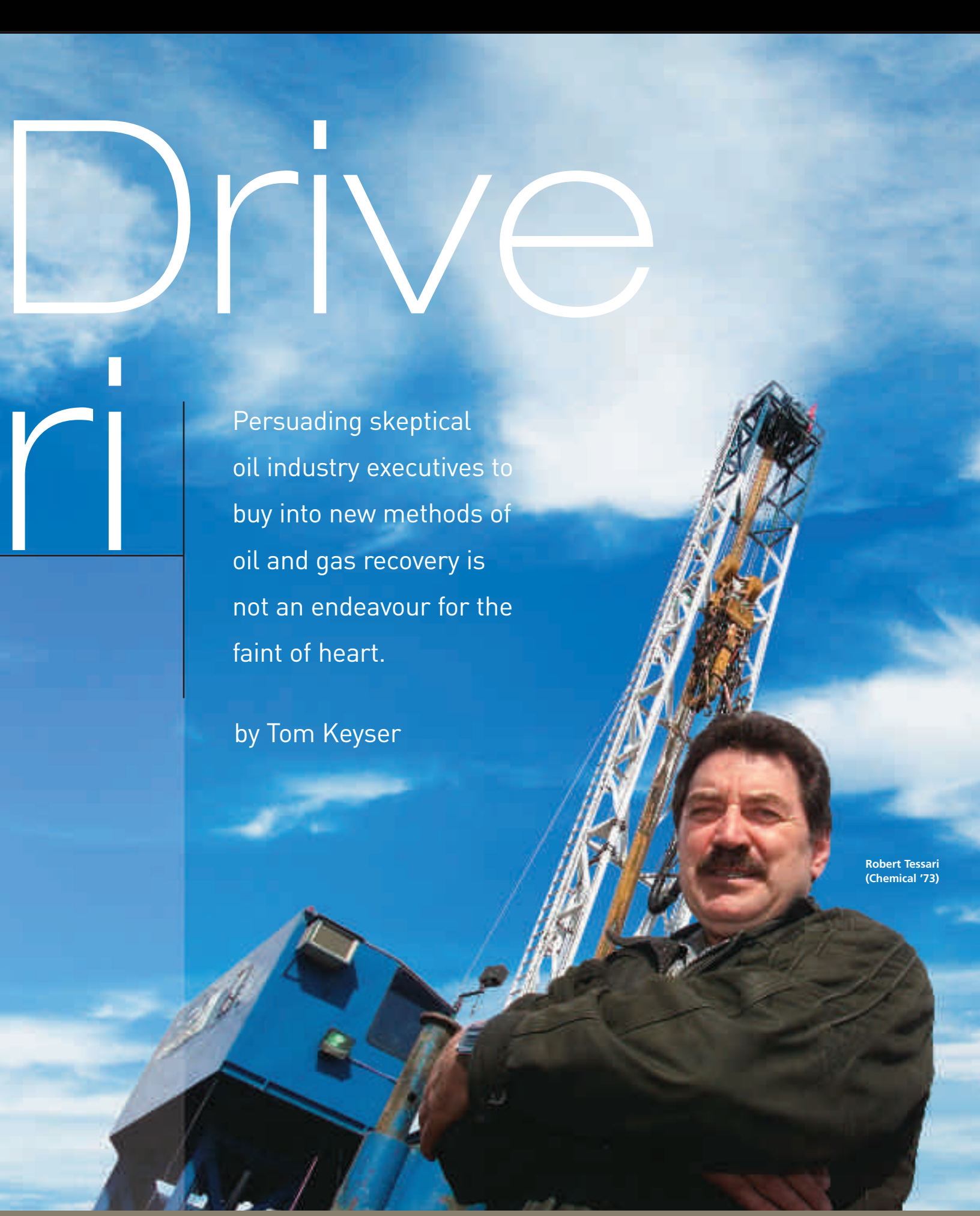
Tessari gazes at the picture with a mixture of nostalgia and pride.

"People ask me, 'What's the hardest thing about developing new technology? Is it getting the original idea?' No, not even close. It's trying to make people realize that you've developed a quality product that they can use to their profit. You need the desire and the will to make it happen."

Drive ri

Persuading skeptical oil industry executives to buy into new methods of oil and gas recovery is not an endeavour for the faint of heart.

by Tom Keyser



Robert Tessari (Chemical '73)

Tessari possesses those qualities in spades. An ambitious and self-confident farm boy, he grew up in the rural community of Warner, Alberta, south of Lethbridge. Later, his family moved to another acreage near Sundre, where he completed high school in 1965.

At first, a post-secondary education held little appeal. While still in school, Tessari routinely spent his summers working on nearby oil rigs and simply adjusted to full-time work after leaving high school. But after four years of hard work in the oil fields, Tessari realized he was adrift in a world of limited horizons and restricted career options. That's when he dusted off his old high school transcript and applied for admission to the University of Alberta.

"I had to go back to Lindsay Thurber Composite High School in Red Deer to upgrade my English," Tessari smiles today.

"Then I went back to the rigs for another year to raise money for my U of A tuition."

He struggled with calculus classes in first year, but somehow managed to survive by sheer determination. After his marriage in third year, Tessari really settled down, impressively elevating his GPA before graduating in 1973.

"I look back and say that my education at U of A was perfect, because it forced me to explore a lot of theory, which has come in extremely handy through the years. I learned a lot about fluid phenomena, corrosion, erosion, heat transfer, and temperature. These are issues which come up in my professional life on a daily basis."

Still a rig rat at heart, Tessari eloquently advocates for collaboration between universities and corporations. At Tesco's offices in both Calgary and Houston, bright students are encouraged to work in the field and in the company's on-site research and development lab to round out their training.

"On-the-job work is extremely valuable for students. I think the successful university should work as closely as possible with industry," says Tessari.

"I remember I aced my well logging course at U of A because I understood the practical application so thoroughly after spending time on the rigs."

Among the opportunities Tessari explored after graduation was an Indonesian posting with Atlantic Richfield (ARCO), the U.S.

energy giant. Working there as an offshore drilling engineer, he got his first taste of top-drive drilling, a technique employed by ARCO's giant open-water oil derricks.

A top-drive hydraulic or electric motor is suspended high in the derrick (or mast) of an oil rig. Tessari considers it a safer and less labour-intensive method for rotating the drill mechanism, especially compared to traditional rigs driven from ground level.

In his days with ARCO, Tessari absorbed as much information as he could about top-drive drilling, all the while wondering whether this super-efficient technology could be successfully adapted to drive smaller rigs on dry land.

One of the first challenges is encapsulated by Newton's Third Law of Motion: For every action there is an equal and opposite reaction. In this case, the equal and opposite action is the torque reaction generated by the swivelling top-drive. It's a force easily absorbed by monstrous offshore oil derricks, but not so readily withstood by conventional, three-sided land rigs.

Tessari got the chance to advance his theories upon his return to Alberta during the mid-1980s. Oil prices were flat at the time, but Tessari still wanted to pursue his brainchild. He joined a small drilling company known as Bluebird, and went to work in an unassuming shop in northeast Calgary. Ultimately, he hooked up with another engineer, named Per Angman, as well as Evert Beierbach, a drilling "tool-pusher" extraordinaire who's now Tesco's vice president of research and development.

"If we hadn't understood the drilling procedure so well from a mechanical point of view, we probably never would have tried to build such a sophisticated piece of equipment," Tessari remarks today.

"We didn't anticipate the cost, let alone such matters as liability. This was an extremely heavy piece of equipment. And you're asking people to work right below it. The liability issues can be kind of tricky."

Tesco was incorporated in 1986 and the first top-drive came into being a year or two later, although Tessari had no plans to market it at the time.

"We just wanted to have one to use on one our five drilling rigs," he says.

"The oil business was slow in the late '80s and there wasn't much work. But that early prototype seemed to perform okay. It was encouraging."

Then one day, Tessari wrapped up a job for BP, and his clients remarked it was a shame they couldn't remove the Bluebird top-drive and transfer it to one of their own rigs in a remote location.

A light bulb clicked in his brain. Tessari went back to his cramped shop with newly raised capital. And in time, it all came together: the first portable top-drive system in Canada.

He shares credit for the patent with Beierbach, his longtime colleague.

"The patent was not for the top-drive so much, it was for the torque track—a tubular bushing that hangs in the derrick," Tessari explains.

"When you turn the top-drive to the right, the bushing transfers the torque load to the base of the rig. And no unwarranted pressure is transferred to the derrick itself."

Tessari's next step seemed obvious—to sell individual drilling companies on the proficiency of the new product. That was a mistake, as it turned out.

At the time, drilling teams sold their services to oil companies on a per diem basis. As a result, they were in no particular hurry to complete their contracts, particularly when business was scarce.

A friend in the business set him straight: "We know your top-drive is more efficient," he confided.

"But we get paid by the day. We sell time; we're not particularly interested in *saving* time."

"I felt like I'd been hit in the head with a baseball bat," Tessari groans ruefully. "I hadn't thought about that before."

So Tessari changed tactics, opting to cut out the intermediary. He started knocking on doors of the oil companies themselves, telling them he and his team could add the top-drive to their existing rigs.

Resistance was strong because, as Tessari explains, "it was something new." Eventually, though, relentless door-knocking paid off. First Lasmo Oil came aboard, using the top-drive to drill the Lloydminster well in 1992. Next, Amoco bought in, renting Tessari's invention for use on its own drill rigs. A subsequent job with his old contacts in Indonesia required an enlarged, more powerful top-drive design. Tessari returned to Alberta, scavenged more funding from his long-suffering backers, and produced it.

Through trial and error, design flaws were eventually identified, then eliminated. And new inquiries began to pour in.

Tessari and his partners took Tesco public in 1992, listing on the Toronto Stock Exchange, and going into the rental business in a big way. Today, the company draws 85 percent of its $200 million yearly revenues from the international market, including about half from the United States.

As Tesco's founder and longtime chief executive, Tessari pulled back in 2005, stepping down as CEO and returning to his first love, research and development.

Now chief technological officer and vice-chair of the Tesco board, he oversees a research and development team that spends $6 million a year fine-tuning old techniques while simultaneously creating new ones.

"I'd like to get that budget cranked up to $10 million," he smiles.

"Now that I'm no longer CEO, I don't have to worry so much about the bottom line."

Among the opportunities Tessari explored after graduation was an Indonesian posting with Atlantic Richfield (ARCO), the U.S. energy giant. Working there as an offshore drilling engineer, he got his first taste of top-drive drilling, a technique employed by ARCO's giant open-water oil derricks.

Tom Keyser is a Calgary-based freelance journalist.

Flight of fancy to

engineered reality

by April Serink

Alvin (Al) Bruchal (Civil '67) has always had an eye on the sky. As a child interested in flying, and then as a teenaged Royal Canadian air cadet, he dreamed of a career in the aerospace industry. Eventually, his flight of fancy became an engineering reality.

The early '60s presented a world of change, political strife, and innovation. From the elation of John Glenn orbiting the earth to the terror of the Cuban missile crisis, the space race, and the looming possibility of nuclear war echoed across the U of A campus. During this time, Bruchal honed his skills in civil engineering, laying the foundation for a career spanning the gamut of engineering specializations.

With his newly acquired iron ring and experience as an engineering aide at the City of Edmonton, Bruchal moved to Washington State in August 1967 to join Boeing. He launched into a

Alvin (Al) Bruchal (Civil '67)

Despite the success of his ground projects, Bruchal yearned for an opportunity to make things fly.

"I needed a return to the sky to apply engineering capabilities in making my dreams come true."

variety of assignments, including the U.S. Navy Patrol Hydrofoil Missileship and commercial jetfoils.

"It really was exciting stuff," says Bruchal.

Using elements of airplane design, such as control and propulsion, hydrofoils skim across water at top speed, to reduce friction and to increase maneuverability. The success of Boeing's hydrofoils led to the development of hydrofoil missileships to transport military equipment, as well as jetfoils, which transport passengers.

To diversify his career, Bruchal accepted the challenge of working for the Boeing Construction Equipment Company. At the time, Boeing sought to expand its focus to include projects based on the ground, as well as in the air.

"My assignments involved designing heavy construction equipment system components for asphalt drum mixer plants, such as conveyors, feeder bins, and drive systems."

In 1971, Bruchal worked with a team to design a Personal Rapid Transit (PRT) system for West Virginia University in Morgantown. The PRT connects separate campuses with single-line guideways, controlled by computer operating systems at each station. The PRT vehicles were constructed at Boeing's Space Center in Kent, Washington.

"The idea was new and cutting-edge," recalls Bruchal.

"The PRT was an alternative to the subway, in that it is a self-contained transit line that shuttles small student groups around the university."

Bruchal worked on the PRT car design, specifically the chassis structure.

"That train took off in 1975," marvels Bruchal, "and it still works!"

The National Society of Professional Engineers named the system one of the United States' top 10 outstanding engineering achievements of 1972.

Despite the success of his ground projects, Bruchal yearned for an opportunity to make things fly.

"I needed a return to the sky to apply engineering capabilities in making my dreams come true."

In 1974, he completed his MBA in business administration from Seattle University. This led to managerial positions on various

Courtesy West Virginia University

Top: A Peacekeeper missile with a W87 warhead undergoing an inspection
Below: The Personal Rapid Transit system in Morgantown

projects including a move to Boeing Defense and Space Group in the 1980s.

"I assumed the role of systems engineer for several major Intercontinental Ballistic Missile-(ICBM-) based studies and development programs with Ballistic Systems Division, including Peacekeeper missiles."

ICBM rockets revolutionized military strategy, with their ability to travel across continents at top speed, delivering nuclear strength to targets in mere minutes. The work helped spark a U.S. military buildup during a time of global conflicts and economic recession.

"I enjoyed the business angle of preparing proposals, analyzing markets, and performing cost trade studies as a working engineer," says Bruchal.

"It prepared me for more secretive defense projects and turned my career with Boeing in a new direction."

That new direction combined his passion for flying, his childhood enthusiasm for the air cadets, and his innate skill as an engineer. Bruchal accepted the role of principal systems engineer in PhantomWorks division,

Boeing's advanced research and development aviation unit.

"There was nothing routine about PhantomWorks," says Bruchal.

"You dream it. You build it. That's it."

His main areas of focus included Joint Theater Air and Missile Defense (JTAMDO) and Network Centric—Command, Control, Communications, Computers, (C4) Intelligence, Surveillance, and Reconnaissance (C4ISR).

The Joint Theater Air Missile Defense Organization (JTAMDO) serves as a management tool for the U.S. Department of Defense. By using simulations and technology demonstrations, the JTAMDO provides better defense against air and missile threats. In addition, the C4ISR provides a framework for developing equipment, advancing skills, and designing processes to help to gather defense information, such as building data processing systems or satellite and sensor technologies.

"My projects with PhantomWorks took me to France for paper presentations and to the UK for airborne missile platform concepts and early warning system lectures. We discussed national defense from land, air, water, and space."

Bruchal still shakes his head at his good fortune.

"What an amazing place for a career to lead; like a kid in a candy store."

Near the end of his career, Bruchal continued to tackle important and innovative projects, including airborne early warning systems referred to as AWACS (Airborne Warning and Control Systems). The military uses these airborne communications command posts, housed in modified commercial airplanes, to monitor and control military operations.

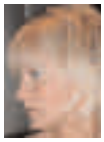
"Prior to 1991, only 707s were used as AWACS; however, we launched the first modified commercial airplanes in 1996 to act as AWACS—the 767," says Bruchal.

"My other PhantomWorks team projects also included the AWACS and the Airborne Early Warning and Control System for foreign customers. I travelled to Japan as Boeing delivered its first two 767 AWACS to the country."

Just shy of 39 years at Boeing, Bruchal retired in June 2006, bidding farewell to the organization that fulfilled his early flights of fancy. He currently finds his feet back on solid ground—and happily so.

"Now I spend time engineering the ultimate fort or LEGO machine for my two grandkids," Bruchal smiles.

"That is the best part of my new career."



April Serink is a Red Deer-based writer and niece of Bruchal's.

SPECIFICATIONS

Jetfoil

First launch: March 29, 1974
Model number: 929-100
Classification: Warship
Length: 27.4 metres
Width: 9.14 metres
Cruising speed: 74 – 93 km/hour
Draft (foilborne): 14 – 20.1 metres
Propulsion: Two Allison 501-KF turbine engines with two Rocketdyne PJ-20 waterjet pumps
Accommodation: Four to eight crew, 250 to 350 passengers

Patrol Hydrofoil Missileship

First launch: November 9, 1974
Model number: 929
Classification: Warship
Length: 40 metres
Width: 8.6 metres
Cruising speed: More than 74 km/hour
Draft (foilborne): 2.56 metres
Propulsion: Two waterjets powered by two 800-horsepower Mercedes-Benz diesel engines (hullborne), one waterjet powered by 17,000-horsepower GE marine gas turbine engine (foilborne)
Accommodation: 21 to 24 crew

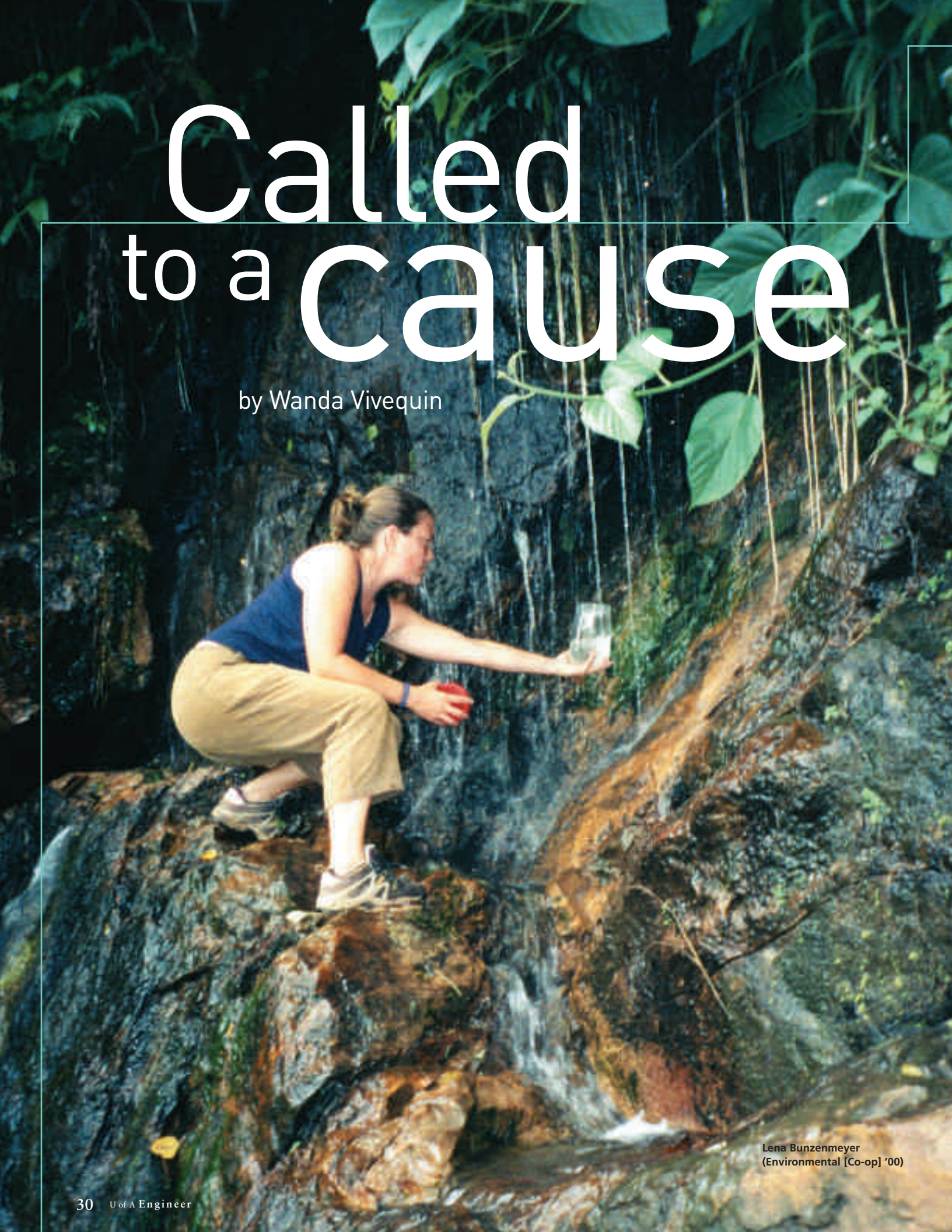
Airborne Warning and Control System (AWACS)

First launch:
May 25, 1976 (E-3A with full mission avionics)
Model number: 707 airframe (E-3)
Classification:
Airborne Warning and Control System
Length: 46 metres
Span: 44 metres
Gross weight: 417 metric tonnes
Top speed: 852.8 km/hour
Endurance:
Six hours at 1,609 kilometres from base
Ceiling:
More than 8,839 metres
Power: Four 9.53 metric tonnes of turbo-thrust turbofan P&W TF-33 engines
Accommodation:
Four crew, 13 to 18 AWACS specialists

Photos courtesy of BOEING.com

Called to a cause

by Wanda Vivequin



Lena Bunzenmeyer
(Environmental [Co-op] '00)

Lena Bunzenmeyer (Environmental [Co-op] '00) knows a thing or two about water.

For example, she knows that most rural Ugandans must get by for an entire day using the amount of water Canadians use in a single flush of the toilet. She shared their struggles firsthand in 2002, as a youth intern with the Canadian International Development Agency.

These days Bunzenmeyer finds herself in a markedly different environment. She now works as a water advocacy advisor in a region of Indonesia that regularly receives torrential rains.

Bunzenmeyer moved to Pontianak, on the island of Borneo, in July 2005. Straddling the equator and in the delta of Indonesia's longest river, the Kapuas, this is an industrial city of almost 600,000.

Bunzenmeyer volunteers for Canadian University Services Overseas (CUSO), a federal development agency. She has been formally asked to lead a process to design, implement, and maintain a database containing information about the rivers and indigenous peoples in the Kapuas watershed area of West Kalimantan. She also works with community groups to monitor the pollution levels of the Kapuas watershed and assist the communities in managing their water resources.

Within days of arriving at the Indonesian agency, Bunzenmeyer discovered that her work reality bore little resemblance to her job description. Fortunately, her experience in Uganda and philosophical approach to life allowed her to adapt quickly. Now, she's much more comfortable working day-to-day in the world's most populous non-Arab Muslim country.

"Indonesian culture is so different from my own in almost every aspect," says Bunzenmeyer.

"Where Western culture values individualism, privacy, and a linear concept of time, Indonesian culture values community and relationships, and a circular (or flexible) concept of time.

"Because of their community and relationship focus, Indonesians see nothing wrong with asking extremely personal questions to people they've never met before, specifically foreigners."

Home for Bunzenmeyer in Pontianak is a tiny two-storey apartment.

"In the mornings I awake gently to the intertwined melodies of three or four different mosques calling the devoted to morning prayers," she says.

Bunzenmeyer sees development work as her personal calling.

"I don't necessarily think it was a choice so much as I've just always felt that this is my path," she says.

"In high school I had a great teacher who guided me into engineering at university. In my second year of university, when I was deciding which discipline to apply for, something clicked in my head and I decided I needed to focus on water projects in developing countries. It just so happened that it was the first year the U of A opened the environmental engineering program and I figured that the program might help me in this field, so I took it."

Today, Bunzenmeyer could very easily be a poster girl for international development. It's hard not to be inspired by the integrity, determination, and commitment that she has shown since graduating in 2000.

Her only break from development work came in 2004, when she moved to the Cayman Islands to work.

"The reasoning was two-fold: warm weather and increasing funds—volunteering doesn't exactly leave you with a healthy bank account!" says Bunzenmeyer.

Water once again played a large part in her life when Hurricane Ivan, a category five storm, hit the Caribbean. As she and others sheltered in a sports complex, Bunzenmeyer managed to send out an e-mail describing the storm's fury.

She wrote, "Not a single power line was left standing, the poles toppled onto buildings and cars, the lines strewn throughout the streets like gigantic metallic snakes. Every building had windows broken, or walls collapsed, or roofs missing. Some were completely flattened altogether. But despite all this, it wasn't the destruction of property that really set in. It was the vegetation, or what was left of it. Most trees had been blown over, particularly the large ones. And those that dared to stand up to Ivan had been stripped, not only of their leaves, but of their branches as well. Lone ragged trunks, standing starkly against the hazy morning sky, gave the impression of a wasteland. And that's exactly what it felt like."

As the rebuilding of the Cayman Islands began, Bunzenmeyer was reminded once again of how difficult life can be. During the cleanup, she spotted an advertisement for work with CUSO in Indonesia, and began to pursue her next posting.

Bunzenmeyer's experiences have given her a strong sense of the strengths and weaknesses of international development efforts.

"I've seen so many examples of bad development that it is easy to dismiss them all," she says.

"But you can't paint the whole picture with just one brush, and I think this is why the concept of appropriate technology is so important. It's definitely a buzzword in this field, but it holds true because in most cases you cannot just bring an idea that has worked in a Western country and directly apply it to another.

"Development is a complex word, and has become very charged over the years. I struggle all the time with the thought that I'm really just meddling in a place where I shouldn't be. Who am I to say that the information, knowledge, and technology that I might bring are better than what has been used in the past?"

However, given the compassion and conviction she brings to her calling, count on Bunzenmeyer to make a positive contribution wherever she travels.

Wanda Vivequin is an Edmonton-based freelance writer.

Editor's Note — Each year during Reunion Weekend at the Dean's Brunch, Dr. Lynch (the Dean of Engineering) provides an informative overview of the history of Alberta, the history of the Faculty of Engineering, and the many significant contributions U of A professors and engineers have made to the province and the nation. Engineering alumni frequently ask for copies of Dr. Lynch's speech. This article is a partial response to such requests.

Engineering *over the decades* (Part Two)

People and events that have shaped engineering from 1909 to present.

1959 The University of Alberta's Engineering Faculty celebrates its 50th anniversary as the third largest in Canada, with 44 full-time staff in Edmonton plus two in Calgary and more than 40 sessional instructors

Dr. George Govier (MSc Chemical '45) becomes dean of Engineering.

S.R. Sinclair (Civil '44, MSc Civil '47) becomes head of Civil Engineering department through to 1973.

U.S. patents are issued for integrated circuits.

1960 The Edmonton International Airport opens at Leduc.

The first University of Alberta buildings open in Calgary.

The first class of Mechanical Engineering graduates.

1961 The U of A's first PhD in Engineering graduates; R.A. Ritter, a chemical engineer.

The Organization of Petroleum Exporting Countries is founded.

Calgary's population reaches 325,000 by the early 1960s while Edmonton approaches 300,000.

1962 The Trans-Canada Highway is opened, a tad prematurely, by Prime Minister John Diefenbaker.

The Candu reactor in Ontario produces the first commercial electricity in Canada from nuclear energy.

Cando reactor

1963 Sketchpad, a forerunner of computer-aided design technology is created at MIT.

The Beatles song "Please Please Me" airs on the radio.

1964 The U of A's first female professor is appointed; Vivienne Joan Harwood, a specialist in high vacuum technology.

Dr. George Walker becomes head of the Electrical Engineering department.

1965 The Trans-Canada Highway is completed at last.

1966 Dr. Karl Clark, who had begun researching the potential of the Athabasca oil sands at the U of A in 1920, dies.

The University of Calgary becomes an autonomous institution.

1967 The Great Canadian Oil Sands Co. (later known as Suncor) uses Dr. Karl Clark's hot water process in the first commercial oil sands plant in Fort McMurray.

Canada celebrates its 100th birthday.

The University of Lethbridge is established.

1968 New buildings are opened to house the Departments of Chemical and Petroleum Engineering, Mining and Metallurgical Engineering, and Mechanical Engineering.

Important Events *1909-Present*

University of Alberta's first computer

1909-1958 When the first engineering course was taught at the University of Alberta in 1909, Alberta's economy was mainly agricultural, with horses providing most of the power. But the world was on the brink of a revolution in science, technology, and engineering. We went from Einstein's first paper on relativity to Hiroshima in 40 years. By the time the Faculty of Engineering turned 50, Canada had built a transcontinental microwave communications network and jetliners flew non-stop across the Atlantic.

During the next 50 years, change accelerated. And no trend was more influential in this period than the rapid development of computing and information technology. The University of Alberta acquired its first vacuum-tube computer for $50,000 in 1957, just in time for its 50th birthday. On the eve of its 100th birthday, virtually every student owns at least one computer, infinitely more capable, small enough to carry in a backpack, and costing around $1,000.

The first artificial satellite circled the world in 1957; today's satellites are the workhorses of a global information racetrack that informs and entertains us.

Like computers, lasers needed special rooms of their own in the 1950s; now they are miniature components inside consumer devices such as CD-ROM drives.

Hardware became ever smaller following the invention of the transistor in 1947 and the integrated circuit in 1959.

The microprocessor, introduced in 1971, would by the year 2000 contain three million transistors on a single chip, each doing the work of a vacuum tube. More miraculous than the machines themselves were their applications. They brought enormous speed and accuracy of calculations, the ability to design and model complex machines without building a prototype, and the ability to search the world in seconds for information.

Camp 18 is established in Calgary.

The Data Acquisition, Control, and Simulation Centre is established in the Department of Chemical and Petroleum Engineering.

1969 *The Engineering Handbook* for 1969-70 includes a full-page ad from nursing students inviting engineering students for dances, a friendly game of football "or a gentle, relaxing back massage."

The first node of the ARPANET, the earliest ancestor of the Internet, goes on line.

A man walks on the moon.

1970 An unexpected drop in enrolment at U of A causes funding cutbacks and a hiring freeze.

Athabasca University is created.

1971 Dean R.M. Hardy (LLD [Hon] '77) suggests limiting the number of foreign students enrolling in first-year engineering programs to 15 percent

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

The first hand-held electronic calculator, the one-pound Sharp EL-8, sells for $395 (U.S.).

The first computer microprocessor, the four-bit Intel 4004, is released.

A U of A graduate, Peter Lougheed, leads the new Conservative government.

1972 The Electrical Engineering Department is awarded a National Research Council grant to investigate laser and plasma technology.

1973 The Arab oil embargo causes royalty revenue to flow into Alberta.

The Mechanical Engineering building opens.

1974 Aided by Canadian technology, India becomes the sixth nation to detonate an atomic bomb.

1975 Altair 8800, the forerunner of the personal computer, is built around an Intel eight-bit processor and marketed to hobbyists.

The Vietnam War ends.

Soviet and American space capsules link together in orbit.

Bill Gates and Paul Allen form a company named Microsoft to market software for the Altair 8800 microcomputer.

The Alberta Oil Sands Technology & Research Authority is established.

1976 Dr. Peter Adams becomes dean of Engineering.

The Concorde aircraft commences the first commercial supersonic flights.

The Alberta Heritage Savings Trust Fund is established.

1977 Associate Dean Dr. Don Quon (Chemical '44, MSc Chemical '46) fears dire shortages of engineers in Alberta in the 1980s as enrolment in the Faculty is capped at 520 students.

Cross Hairs on History

THE 1960s The postwar baby boom arrived at the University of Alberta during this decade, stretching the University's facilities to the limit. In 1961, Engineering dean Dr. George Govier (MSc Chemical '45) produced a long-term plan for engineering education in Alberta that included building an Engineering Centre on the northwest corner of the U of A campus. That it took four decades to happen is, in retrospect, surprising.

Dr. George Govier (MSc Chemical '45)

Syncrude, Fort McMurray

Innovations spawned during the Second World War came of age in the 1960s—radar, jet engines, digital computing, rocketry, and atomic energy. Alberta grew up, too. With its emerging petroleum industry and royalty revenues, everything seemed to be built in pairs: two identical petrochemical plants east of Edmonton, two Jubilee Auditoriums, and twinned highways.

Planning began for two oil sands plants near Fort McMurray: the Great Canadian Oil Sands Co. (now Suncor) in 1967 and Syncrude in 1978.

Even with a new engineering school at the University of Calgary, Alberta had two job openings for every new iron ring handed out in the province.

THE 1970s Remembered as the time of disco dancing and the OPEC oil crisis, the 1970s began on a down trend at the Faculty

The Apple II computer is introduced.

1978 Edmonton's Light Rail Transit opens.

1979 The Alberta Home Heating Research Facility is built at Ellerslie.

The VisiCalc spreadsheet software is introduced.

1980 A professorship is established in Construction Engineering.

Work begins on the IEEE 802 protocols for wireless computing applications.

Ottawa introduces the National Energy Program.

1981 The Faculty of Engineering introduces the Co-op study program, with 30 companies employing third- and fourth-year engineering students for an average of $1,400 per month. Forty-one of 110 mechanical engineering students sign up.

The U of A offers a degree in Computer Engineering; 20 second-year students enroll.

The Space Shuttle's Canadarm, developed by hundreds of engineers across Canada at a cost of $115 million, flies in orbit for the first time.

IBM markets its first personal computer.

1982 The Alberta Microelectronics Centre is established; is privatized in 1998, is now known as Micralyne Inc.

The Alberta Summer Institute for Petroleum Industry Development (now the Canadian Petroleum Institute) trains its first students from developing countries.

The first artificial heart patient survives for 112 days after the implant.

AutoCAD 1.0 is released.

1983 Premier Peter Lougheed opens the CAD/CAM lab in the Department of Electrical Engineering.

The Centre for Frontier Engineering Research is established. It is now known as C-FER Technologies, a subsidiary of the Alberta Research Council.

The first TCP/IP network is constructed by the U.S. National Science Foundation. This marks the birth of the Internet.

1984 Apple's Macintosh is the first graphical user interface personal computer.

Marc Garneau is the first Canadian in orbit.

1985 Dr. Fred Otto (Chemical '57, MSc Chemical '59, PhD Chemical '62) becomes dean of Engineering.

The Alberta Laser Institute is established.

Peter Lougheed retires from politics; is succeeded by Don Getty.

Microsoft releases Windows 1.0.

of Engineering, with falling enrolment resulting in cutbacks and hiring freezes at the U of A. Unprecedented economic growth followed the first Arab oil embargo in 1973 and a second in 1978—stimulating growth in petroleum, chemical, and mechanical engineering. The first wave of the environmental movement created new standards for the handling of all types of waste, from car exhaust and smokestack emissions to household garbage and liquid effluent.

Meanwhile in the Electrical Engineering Department, the next new thing was coming down the pike in the form of laser research and microcomputers. From here on, bigger and better was no longer the only path to progress: smaller, faster, and better was the new mantra.

THE 1980s The oil price bubble burst, interest rates soared, and many Alberta businesses and individuals in Alberta couldn't make the payments anymore.

But the 1980s also was an era of great progress for the Faculty of Engineering. Dean Peter Adams launched the Co-op program, making paid work in real-world engineering jobs a part of the formal education of an engineer. (Today, one in three undergrads is in a Co-op program.)

Also during the 1980s, minicomputer workstations and later desktop computers made possible an explosion of new applications such as computer-aided design. These tools made engineers and engineering firms dramatically more productive.

The Engineering Faculty embarked on a series of new enterprises: the petroleum summer institute, frontier engineering research, construction engineering, laser research, telecommunications research, microelectronics, and computer process control.

THE 1990s In the wake of a tragedy at École Polytechnique in Montreal in the last month of 1989, Canada's engineering schools searched for ways to increase and support female enrolment. (Female undergrad enrolment in the U of A Engineering Faculty rose from 14.2 percent in 1990 to 20 percent in 2006-07.) After a rocky start to the decade—funding cutbacks hit again in 1992—the 1990s proved to be another very positive decade for the faculty.

When Dr. David Lynch (PhD Chemical '82) became dean in 1995, Alberta was growing again and positioning itself in a "knowledge economy" was a priority. The Faculty of Engineering added 100 new members and enrolment ballooned.

Dr. David Lynch (PhD Chemical '82)

The computer revolution moved from the office to the home in the 1990s. Technology became embedded everywhere—a new car could have more microprocessors than pistons.

During the 1990s climate scientists sounded an alarm about global warming. The Kyoto Protocol negotiated in 1997 would make greenhouse gases, practically unheard of in the mainstream in 1990, the envi-

1986 The Alberta Research Council moves to new headquarters on Karl Clark Road adjacent to the Edmonton Research Park.

Chemical Engineering students are offered a program in computer process control.

The Alberta Telecommunications Research Centre is established; is now part of TRLabs, Canada's largest telecom research laboratory.

The Chernobyl disaster occurs.

Chernobyl

1987 The Canada-U.S. Free Trade Agreement is signed.

The province halts contributions to the Heritage Fund due to a collapse of energy prices.

1988 Calgary hosts the Winter Olympics.

1989 Fourteen female engineering students are murdered by a lone gunman at École Polytechnique in Montreal.

École Polytechnique memorial service at U of A, 1990

1990 U of A and six other Canadian universities search for ways to increase the number of women enrolled in engineering schools. (Female undergrad enrolment would rise from 14.2 percent in 1990 to 20 percent in 2006-07.)

1991 The University Centre for Advanced Engineering Materials is established.

An enrolment record is set: 2,251 students, including 281 women and 581 Co-op students.

Syncrude and the Faculty team up to offer graduate courses in Chemical Engineering in Fort McMurray.

1992 The U of A cuts the quota for first-year engineering to 550 students from 600.

The Canadian Engineering Human Resources Board predicts Canada will have a shortage of engineers by 2000.

Don Getty retires from politics; Ralph Klein becomes premier of Alberta.

1993 The World Wide Web takes off with the introduction of the Mosaic browser.

1994 The Channel tunnel opens between England and France.

Jupiter is bombarded by fragments of comet Shoemaker-Levy 9.

Netscape Navigator 1.0 is released.

The Boeing 777 takes flight. This is the first airplane designed entirely on computer.

1995 Dr. David T. Lynch (PhD Chemical '82) is appointed dean of Engineering.

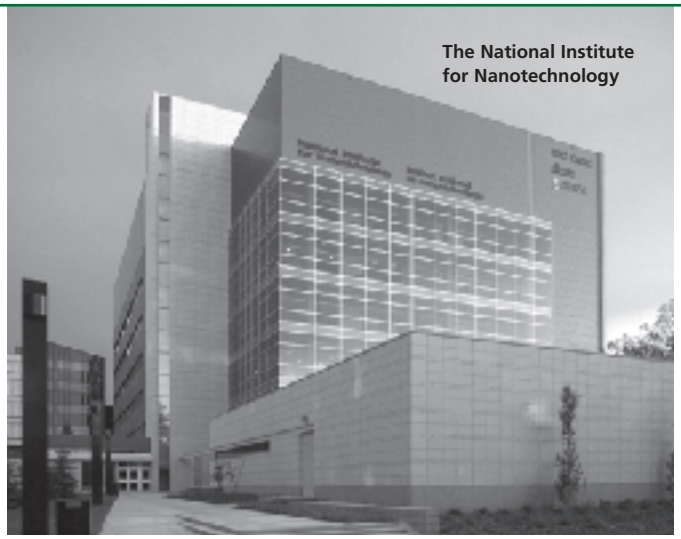
A BSc in Environmental Engineering is offered.

Dr. Roderick Fraser is appointed to his first of two five-year terms as president of the U of A.

ronmental priority by the end of the decade—at the same time as Alberta was embarking on a rapid expansion of its oil sands production.

THE 2000s Forty years after Dean George Govier proposed it, an engineering centre takes shape on the northwest quarter of the U of A, and a blizzard of acronyms settles on the campus map. There's the Allan P. Markin/ Canadian Natural Resources Limited Natural Resources Engineering Facility (NREF), the Electrical and Computer Engineering Research Facility (ECERF), the Engineering Teaching and Learning Complex (ETLC), and one acronym you can actually pronounce: NINT, the National Institute for Nanotechnology.

The Faculty of Engineering, has grown into one of Canada's leading engineering schools with 3,300 undergraduate students, 1,030 graduate students, and 160 professors in 2006.



The National Institute for Nanotechnology

Here's another acronym: NSERC, for the Natural Sciences and Engineering Research Council, which has provided more than $500 million to the U of A since it began investing in research in 1978-79.

Building on a tradition that began in 1921 with the founding of the Alberta Research Council on campus, the U of A also has become one of Canada's premier research centres, with hundreds of millions of dollars a year in outside research funding from diverse government, corporate, and private sources.

The next 50 years Through most of the 20th century the engine of innovation was war. Over the next 50 years, to take an optimistic view, sustaining life will be the motivating force.

Reducing the footprint that people and industry make on the natural world will benefit wildlife and save millions of human lives as well.

Collaboration between engineers and the medical professions will produce better medical devices and prostheses for aging baby boomers.

In the 1960s and 1970s, anything that began with "micro" was considered cool. Today's cutting edge technology sports the prefix "nano." Today's U of A researchers are trying to create the world's sharpest point, only one atom wide at the tip. They are also working on single-molecule transistors and nanomachines that will break down scar tissue from inside a patient's body.

And 50 years from now there will be as many as 100,000 University of Alberta engineers in the world, adding to humanity's ever-expanding toolbox, or finding better ways to use the stuff that's in there already.

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

1996 A merger of departments creates the first Chemical and Materials Engineering Department in Canada.

Tax and regulatory changes stimulate a new boom in oil sands investment, research, and development.

Dr. Chris Backhouse, an Electrical Engineering professor is honoured for work on "lab on a chip" technology.

The imaging systems lab is established.

1997 Syncrude announces a $6-billion expansion at Fort McMurray, marking the first of a new wave of oil sands mega-investments.

The Kyoto protocol is negotiated with the aim of reducing greenhouse gas emissions worldwide.

1998 The U of A acquires a $2-million, 40-processor Silicon Graphics (SGI) supercomputer.

A Chair is appointed in thin-film engineering research.

Alberta makes a large financial commitment to adult learning programs.

The Exxon-Mobil merger is announced.

The NASA probe finds enough ice in lunar craters to support a human colony on the moon.

1999 The laptop computer is considered an ideal tool for U of A Engineering students.

The U of A aims to double the size of its Engineering Faculty to become the largest engineering school in Canada.

2000 A U of A fundraising campaign raises $193 million, the third largest in Canadian history.

$1 million from Cisco Systems Canada helps to fund a new Master's program in Internet technology.

2001 The University of Alberta is selected as the home for the National Institute for Nanotechnology.

Dr. Allan P. Markin (Chemical '68, LLD [Hon] '02), and the company he chairs, Canadian Natural Resources Ltd., each contribute $3 million to a new natural resources engineering building.

Donald Stanley (Civil '40, DSc [Hon] '88), the founder of Alberta's largest engineering firm Stantec, dies.

2002 A $5-million donation from the Hole family, whose construction company Lockerbie and Hole traces its roots back to 1908, creates the Hole School of Construction Engineering.

Two state-of-the-art buildings open in the Engineering Centre envisioned 41 years earlier by Dean Govier: the Electrical and Computer Engineering Research Facility (ECERF) and the

Notable People and Events

Learning to solve problems is the essence of an engineering education— it also is a vital skill in the business world. Many exceptional careers began in the classrooms of the Faculty of Engineering, including these of notable people who graduated since 1959:

The Hon. Harvie Andre (Chemical '62; PhD Chemical '66), federal cabinet minister from 1984 to 1993, best known for privatizing Canada Post.

Stephan Benediktson (Civil '62), international oil executive and founder, Benson Petroleum Ltd.

Neil Carmata (Chemical '75), vice president, corporate communications and planning, Petro-Canada.

Ed Chwyl (Chemical '65; MSc Petroleum '68), founding partner, Tarragon Oil and Gas Ltd.

Patrick Daniel (Chemical '68), president and CEO, Enbridge.

Lorenzo Donadeo (Mechanical '81), president and CEO, Vermilion Energy Trust.

Sid Dykstra (Chemical '80), president and CEO, OPTI Canada Inc., whose Long Lake project is about to become a major oil sands producer.

Nabih Faris (Chemical '73), legendary oilpatch dealmaker; currently president and CEO, the Intergulf Development Group.

Len Grenier (Electrical '80), founded Vancouver-based Advanced Light Imaging in 1986; acquired in 2002 by McKesson Corp.

Brad Hogg (Computer '94), founder, president and CEO of Vintacom Media Group, a leader in online dating.

Jack Hole (Mechanical '78), executive vice president, Lockerbie & Hole.

Hal Kvisle (Civil '75), chief executive, TransCanada Corp.

John R. McDougall (Civil '67), president and CEO, Alberta Research Council.

Dr. Gwyn Morgan (Mechanical '67, LLD [Hon] '06), former president and CEO of EnCana Corp., created by the merger of PanCanadian Energy and the Alberta Energy Corp. in 2002. Named most respected CEO in Canada in a peer survey.

Ron Nolan (Electrical '60), chair, Hatch Ltd., a Canadian process and metallurgical design firm with 4,500 employees worldwide.

Don Pether (Metallurgical '70), former president and CEO, Dofasco Inc.

Fred Pheasey (Mechanical '65), founder, Dreco Energy Services Inc., acquired by National-Oilwell of Houston in 1997.

Dr. Ray Rajotte (Electrical '71; MSc Electrical '73; PhD Electrical '75), professor of surgery and director of the U of A Islet Transplantation Group.

David Robson (Electrical '61), former chair and CEO, Veritas DGC Inc.

Allan Scott (Mechanical '68), president and CEO of Edmonton Economic Development Corp.

Nizar J. Somji (MEng Chemical '85), founder of industrial software developer Matrikon.

Dr. James Stanford (Petroleum '60, LLD [Hon] '00), former president and CEO, Petro-Canada.

Jim Stewart (Civil '71), president and CEO, UMA Group.

Al Stowkowy (Civil '77), president and COO, Stuart Olson Construction.

Reginald Toliver (Mechanical '64), president and CEO, Luscar.

Linda Van Gastel (Chemical '67; MSc Chemical '72), former vice president, EnCana Corp.; former president, Association of Professional Engineers, Geologists, and Geophysicists of Alberta.

Dr. Fred Vermeulen (Electrical '60; PhD Electrical '66), scored an exceptional 4.9 out of 5.0 in student evaluations during a 35-year teaching career in electrical engineering.

EDITOR'S NOTE This is a nonexhaustive list. I welcome your feedback and additions.

Engineering Teaching and Learning Complex (ETLC). These are the first new engineering buildings on campus since 1972.

2003 U of A Engineering alumnus Dr. Benjamin Torchinsky (Civil '47, MSc Civil '49, DSc [Hon] '03) is awarded an honourary doctorate of science.

Engineering physics student Lindsay LeBlanc (Engineering Physics '03) graduates with a perfect record of 46 grades of nine in 46 courses.

2004 The $65 million Allan P. Markin/Canadian Natural Resources Limited Natural Resources Engineering Facility (NREF) opens.

Imperial Oil contributes $10 million to establish the Imperial Oil Centre for Oil Sands Innovation. It is the largest cash commitment to the Engineering Faculty in its history.

The National Institute for Nanotechnology purchases the world's first transmission electron microscope.

Canada's first flash fire room opens to test protective clothing.

U of A engineers design a computer chip that is 100 times more energy-efficient than anything currently on the market.

Augustana University College in Camrose becomes part of U of A.

2005 Indira Samarasekera, a mechanical engineer, becomes president of the University of Alberta.

"Lab on a chip" medical testing technology is readied for clinical trial.

First-year engineering curriculum is offered in French by the U of A's Faculté Saint-Jean.

The $13-million Centre for Surface Engineering opens.

Dr. David Lynch is appointed to third term as dean of Engineering Faculty.

The Kyoto protocol comes into effect.

Alberta celebrates its 100th anniversary as a Canadian province.

Edmonton becomes the sixth metropolitan region in Canada to reach one million in population.

The University of Alberta experiences the biggest funding surge in more than 20 years as energy prices soar.

There are 28,333 professional engineers licensed by APEGGA to practice in Alberta (more than twice the total population of Calgary in 1905).

2006 The National Institute for Nanotechnology opens.

SOURCES

ONLINE SOURCES—Alberta Research Council, Canadian Society for Civil Engineering, Wikipedia, Corporation of the Seven Wardens Inc., University of Alberta, University of Calgary, Edmonton Economic Development Corp., Canadian Broadcasting Corp., *Edmonton Journal*, and *Alberta Venture*.

BOOKS—*Sons of Martha*, Dr. George Ford (Civil '42, MSc Civil '46, DSc [Hon] '88); *Leduc* by Aubrey Kerr, 1991; *Canada's New Main Street: the Trans-Canada Highway*, David W. Monaghan, 2002; *The Story of Canadian Roads*, Edwin Guillet, 1966; *Oil Sands Scientist: The Letters of Karl Clark*, Mary Clark Shepherd, 1989; *The Great Canadian Oil Patch* (2nd ed.), Earle Grey, 2005.

FYFE, Dr. KEN
(Mechanical '80, MSc Mechanical '83) PEng

supervised an award-winning research paper entitled "Evaluation of a new method of heading estimation for pedestrian dead reckoning using shoe mounted sensors" written by MSc candidate Ross Sterling. This research paper received the Royal Institute of Navigation Michael Richey Medal for best research results published in *Navigation, the Journal of the Royal Institute of Navigation*. The research demonstrated the feasibility of utilizing extremely low-cost and low-power sensors to determine location in areas where GPS signals are degraded or unavailable.

HICKEY, DON
(Electrical '71) PEng

has been reappointed as vice president operations for the University of Alberta.

KOCH, DR. BOB
(Mechanical '85)

was recently awarded the Teetor Award for excellence in engineering teaching by the Society for Automotive Engineers (SAE). The award, established in 1965, recognizes outstanding engineering educators and offers them the opportunity to meet and exchange views with practicing engineers in their fields. The award is funded by the late Ralph R. Teetor, the 1936 SAE international president, who believed that engineering educators are the most effective link between engineering students and their future careers. Koch is an associate professor of mechanical engineering at the University of Alberta. He is involved in student vehicle projects and served as the faculty advisor for Future Truck. Previously, he worked for DaimlerBenz/DaimlerChrysler and General Motors. He is a member of SAE International and the Institute of Electrical and Electronic Engineers.

MORGAN, GWYN
(Mechanical '67, LLD [Hon] '06) PEng

has been appointed to the board of HSBC Holdings plc as a non-executive director. HSBC is one of the world's largest banking and financial services organizations.

SHAH, DR. SIRISH
(PhD Chemical '77)

received the D. G. Fisher Award for his substantial contributions to theory, practice, and education in the field of systems and control engineering. The award is sponsored by the Department of Chemical and Materials Engineering, University of Alberta, Suncor Energy Foundation, and Shell Canada Limited. Shah currently holds the NSERC-Matrikon-Suncor-iCORE Senior Industrial Research Chair in Computer Process Control.

SWEENEY, DOUGLAS
(Mining '94, MSc Mining '04)

has been awarded the 2006 (British Columbia) Lieutenant Governor's award for Innovation in Public Safety. This is in recognition of his doctoral research entitled "Cognitive Profiling of Industrial Accident" and for a significant and innovative approach to analyzing the investigations of incidents and accidents to determine the extent to which organizational culture and other considerations factor into their causation. Sweeney is the manager of occupational health and safety at Thompson Rivers University.

WALKER, GEORGE
(Civil '50)

had a neighbourhood named after him. The City of Edmonton naming committee board unanimously agreed to name an Edmonton southeast neighbourhood "Walker Lakes." The area is bounded on the north by Ellerslie Road (9th Avenue SW), on the south by 25th Avenue SW, on the west by 66th Street SW, and on the east by 50th Street SW. This naming is in honour of Walker's work with Canadian Housing and Urban Development (Edmonton division).

in memoriam

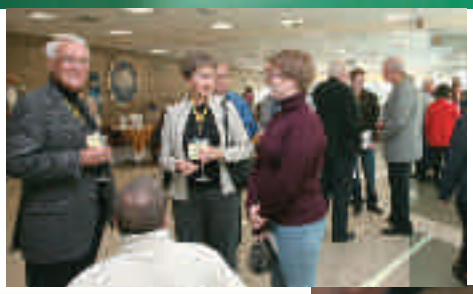
The Faculty of Engineering sincerely regrets the passing of the following alumni and friends.

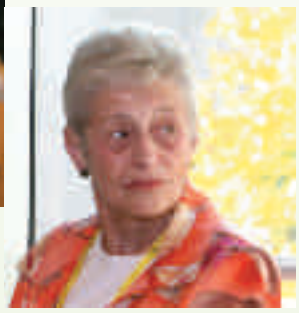
Bower, Raymond (Civil '49)
Brodribb, Thomas (Mining '02)
Brownlee, J. Allan (Chemical '43)
Bull, Alexander (Chemical '50)
Canning, Tony (Electrical '75)
Coffin, Hugh (Chemical '52)
Doze, Warren (Electrical '45)
Drew, Alfred (Civil '27)
Erikson, Robert (Mining '49)
Hodge, George (Civil '47)
McDonald, Robert (Civil '59)
McKoen, John (Civil '62)
Monaghan, Cecil (Electrical '39)
Naoum, George (Civil '55)
Neal, Jack (Electrical '52)
Poole, Dr. John (Civil '37, LLD [Hon] '87)
Sikstrom, Roy (Chemical '58)
Walker, Wayne (Mechanical '77)
Ward, R. Lyle (Civil '64, MSc Civil '66)

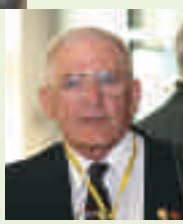
The Faculty of Engineering was recently made aware of the following alumni who passed away more than a year ago.

Hislop, Richard (Civil '43, MSc Civil '47)
Lazerte, Dr. James (Chemical '44, MSc Chemical '46)
Willson, Peter (Civil '56)

Reunion 2006







During Reunion 2006, the Faculty of Engineering welcomed over 200 alumni and their spouses to the annual Dean's Brunch for a buffet and congenial conversation in the Solarium of the Engineering Teaching and Learning Complex.

This was an especially memorable reunion for William Kent (Civil '31) (photo in upper left hand corner, second from the top) who marked his 75th year since graduation.

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Help support the Faculty of Engineering
Make a charitable bequest

Including a charitable bequest in your will is an effective method of supporting the Faculty of Engineering without compromising your current standard of living. Bequests are usually one of the largest gifts an individual can make. They minimize the income and capital gains to the estate, thus allowing more of the estate to be used as you desire.

For further information contact:

David M. Petis, Assistant Dean
External Relations, Faculty of Engineering, University of Alberta
E6-050 Engineering Teaching & Learning Complex
Edmonton, AB T6G 2V4
Tel: 780.492.5080 Fax: 780.492.0500
E-mail: david.petis@ualberta.ca

Christine Thom (Computer '92) wanted to ease the financial strain on future Engineering students. She made a charitable bequest to the Faculty of Engineering and established an endowed scholarship.

I wish to make a gift of:

☐ $100 ☐ $500 ☐ $1,000 ☐ $2,500 ☐ Other $_____

☐ Cheque (made payable to the University of Alberta) ☐ VISA ☐ MasterCard

_____/_____/_____/_____/ expiry date: _____

Name (please print): _____

Signature: _____

I have also enclosed:

☐ a corporate matching gift form from my (or my spouse's) employer

If you were an Alberta resident on December 31, 2006 and have already given $200 elsewhere, your combined income tax savings will be:

Your donation to the U of A	$100	$500	$1,000	$2,500
Your tax credit for your gift:	$42.00	$209.00	$418.00	$1,045.00

* To best meet Faculty of Engineering's needs, donations may be directed to endowed funds. Donations made to endowment funds are invested in perpetuity and the investment earnings are used to advance the specified purposes of the fund within the University.

I would like my gift to support:

$ _____ Faculty of Engineering in support of undergraduate student projects, new educational initiatives in all disciplines, and general student life enhancement activities.

$ _____ Chemical and Materials Engineering Fund*

$ _____ Civil and Environmental Engineering Fund*

$ _____ Electrical and Computer Engineering Fund*

$ _____ Mechanical Engineering Applied Learning Laboratory Fund*

$ _____ Mining and Petroleum Engineering Fund*

☐ I would like information on how to make a gift of publicly traded securities to support the Faculty of Engineering at the U of A.

☐ I would like information on how to include the Faculty of Engineering at the U of A as part of a will, life insurance, or other planned gift instrument.

☐ I have provided for the Faculty of Engineering at the U of A in a will or trust agreement.

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E6-050 Engineering Teaching & Learning Complex
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