



UNIVERSITY OF ALBERTA

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SCIENCE

contours

FACULTY

UMNI MAGAZINE

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**UNIVERSITY
CREATES
SPACE
INSTITUTE**

**Honouring Mama
Lu's spirit of
giving**

**ARCTIC PONDS
DRYING UP**

*Reading
our body's
chemicals for
better diagnosis*

**ALUMNUS TURNS
GRIEF INTO HOPE**

**Fine arts
students liven
up lab space**

**artificial
intelligence**
through games

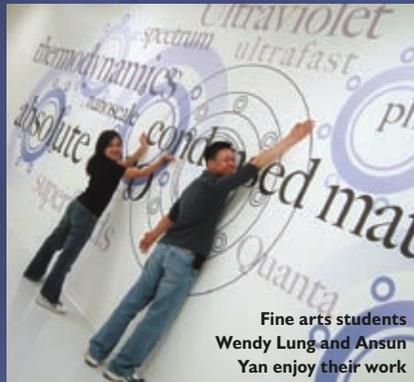




MESSAGE FROM THE DEAN

An Intersection Between Arts and Science

Phase 1 of our new Centennial Centre for Interdisciplinary Science (CCIS) was nearing completion when I happened upon a student art competition on campus. It occurred to me then that it would be wonderful to have students help us put some finishing touches on our new space.



Fine arts students
Wendy Lung and Ansun
Yan enjoy their work

After a few conversations, two different classes - one in Integrative/Exhibit Design and the other in Printmaking - were tasked with coming up with ideas. The results are astounding.

To begin with, the students had to wrap their heads around the purpose and uniqueness of the building. CCIS is one of the few facilities in the world to house interdisciplinary teams under one roof and Phase 1 is no different. Composed of two floors located underground between the Biological Sciences Building and the old Physics Building, it houses labs for physics, nanotechnology, surface engineering and ecology. An eclectic collection of labs, to be sure.

Students from both classes presented their concepts to a panel of scientists representing the different disciplines occupying space in Phase 1 of the new building. Four concepts for murals from the Integrative/Exhibit Design class were retained and the students were asked to pursue the project to production. These murals now adorn walls in Phase 1. Students from the Printmaking class produced seven prints representing the connection between poetry, art and science. When we saw these prints, the conclusion was obvious. We had to hang them all on our walls. They are in production now.

It was a great thrill to see the energy and creativity these students brought to the project. It is reflected in the quality of their work. The next time you're on campus, visit Phase 1 of the CCIS building. It'll be well worth your time.

Gregory Taylor
Dean of Science



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Dean of Science
Gregory Taylor

Assistant Dean, External Relations
Claudia Wood

External Relations Team
Katherine Captain, Emily Lennstrom,
Michel Proulx, Traci Toshack,
Kevin Websdale

Editor
Michel Proulx

Graphic Design
Studio X Design

Contributing writers
Bev Betkowski, Kris Connor, Michel
Proulx, Isabela Varela

Cover photography
Richard Siemens, Creative Services,
University of Alberta

Send your comments to:
The Editor, Science Contours
CW 223 Biological Sciences Building
University of Alberta
Edmonton, AB, Canada T6G 2E9
Tel: 780.492.4073
Fax: 780.492.4827
Toll-free: 800.358.8314
E-mail: contours.science@ualberta.ca
Website: www.science.ualberta.ca

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 Through a set of remarkable coincidences, scientist David Wishart was able to connect dots where others hadn't. The result is leading to much quicker and better diagnoses of complex diseases.
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 The U of A's new Institute for Space Science Exploration and Technology will bring together researchers of diverse expertise. So what's the big deal? It could lead to a brand new, exciting industry in our province.
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 How a U of A grad who lost his family in the Air India Bombing in 1985 was able to overcome his terrible grief and bring hope to thousands of people in his homeland.
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 Donors, whether they're individuals, associations or companies, have many different reasons for giving to the Faculty of Science. All make a difference for the students and the programs they support.

cover story

16 **How two games are advancing artificial intelligence**

Not only did Jonathan Schaeffer oversee the biggest problem ever solved by computers to date this past summer, he was also part of a team that took on two of the world's best poker players in a classic man-versus-machine showdown. The big winner? Artificial intelligence.





Arctic Ponds Drying Up Faster Than Expected

Scientists have uncovered alarming evidence that high Arctic ponds, many of which have been permanent bodies of water for thousands of years, are completely drying out during the polar summer.

The shallow ponds, which dot the Arctic landscape, are important indicators of environmental change as they are especially susceptible to the effects of climate change because of their low water volume, according to Marianne Douglas, director of the Canadian Circumpolar Institute and professor of Earth and Atmospheric Sciences. For the past 24 years, Douglas and her colleague John Smol, a professor of biology at Queen's University, collected detailed data that included water quality and water levels from approximately 40 ponds. Collectively, this data represents

the longest record of systematic limnological (the science of the properties of fresh water) monitoring from the high Arctic.

study ponds dried up completely and water levels in others fell dramatically.

"Some of the ponds were 6,000 years old. They've been in existence for millennia," said Douglas. "It was quite shocking to see some of our largest study ponds dry up by early summer."

The ecological ramifications of these changes are likely severe and will be felt throughout the Arctic ecosystem, says Douglas. It could affect waterfowl habitat and breeding grounds, invertebrate population dynamics, food for insectivores and drinking water for animals, to name only a few.

"These surface water ponds are so important because they are often hotspots of biodiversity and production for microorganisms, plants and animals in this otherwise extreme terrestrial environment," said Douglas. "The significance of that is that the Arctic is changing. It's changing faster than we might have anticipated."

Marianne Douglas and her colleague drill a hole in an Arctic pond to measure its depth.



Until recently, the ponds were permanent features of the landscape, but in early July 2006, because of warming trends in the Arctic, several of the main

Forensics Expert Trying to Foil Fishy Poachers

After four years in an RCMP lab, forensic scientist Lindsey Burke is turning her attention to fish.

The DNA analyst is pursuing a masters degree in biological sciences. Her research project is focused on Alberta walleye living in the Athabasca River and in 11 Alberta lakes.

Using DNA extracted from fish fins previously collected by fisheries biologists, Burke wants to help find ways to keep walleye genetically strong and to foil individuals who may be illegally harvesting walleye.

"The number of anglers per lake is far more in Alberta than anywhere else in Canada," she said, noting that several decades of increasing harvest pressure on relatively few lakes have left the Alberta walleye fishery in a weakened state. "There is now a need to have more tools available to actively manage walleye in a way that creates and maintains a healthy fishery and preserves the natural genetic diversity of the species."

Burke's research will focus on specific regions of the DNA. She'll study it for variations that will indicate differences between walleye populations. She thinks that walleye populations from different lakes will be genetically different from one another, due to isolation and a lack of migration. "This may be why stocking fish from one lake to another is not consistently successful."

Knowing the genotypes of distinct walleye populations will make it easier to track the success of stocked versus natural fish populations sharing the same water. Tighter genotyping will also make it easier to nab poachers, because wildlife officers will be able to pinpoint the lake of origin.

Lindsey Burke will be looking at a lot of fins as she tries to keep walleye genetically strong and catch poachers.



Star Trek's Holodeck Here Today

Computer scientist Pierre Boulanger has developed a technology that lets people half a world away meet and feel as if they're in the same room.

"When you see it, it's very Star Trek-ish," says Boulanger about the science fiction television program set in the 24th century. "It's really the next generation of communication devices."

Current mass videoconferencing technology doesn't project life-size images nor do the images flow well as they do in film or television. The resolution of the picture of this new technology is so high, it allows participants to see body language details such as a small bead of sweat. "It's good enough to be used for negotiations," says Boulanger.

He began developing the technology more than six years ago when he kept receiving requests from people to see what he could do to improve videoconferencing. At that time, computer giant HP was looking for collaborators to help it develop this type of technology and Boulanger fit the bill.

HP markets the technology as the Halo System, which is priced at about \$250,000. Boulanger and Edmonton-based TRILabs, an important partner in the project, are working to see how to keep the quality of the product at a reduced cost.

Boulanger is also working on technology similar to what was shown in

the most recent Star Wars movie where life size images of participants were projected on chairs in a meeting chamber. "That's the next step," says Boulanger. "The original patent was to digitize the person, extract him or her from the background. Then you could bring that person into a virtual meeting room."



Student Athlete Changes Track

Unexpected success at the recent 2007 Canadian Track Cycling Championships has convinced Biological Sciences graduate Tara Whitten to change athletic pursuits.

Whitten, a first-year MSc student, won two races and finished second in two other races at the championships last September in New Brunswick. It's a remarkable feat given the fact Whitten was an elite cross-country skier for many years, was a member of the national cross-country skiing team in 2005, and only started cycling a few years ago for cross-training purposes.

"I was happy with all my races," she says of her results at the national track cycling championships. "I was surprised to be that competitive and that's what made me think I should maybe start focusing on cycling."

Ultimately, Whitten decided to change sports because she felt she had more potential in that sport. "I'm excited by all the areas that I can see for improvement," she says. But the decision wasn't an easy one. "I have a lot invested in skiing and I love skiing," says the Edmonton native who has been participating in cross-country skiing races since she was in grade 6. "I feel like all of the years I spent training for skiing can only help me in terms of fitness and experience as an athlete as I make the transition from skiing to cycling."

Whitten will continue to train as elite athletes do – sometimes as much as 15 to 20 hours a week – and continue to pursue her MSc which she treats as a full-time job, trying to put in consistent eight-hour days. "I don't do that much else," admits the 27 year-old who has an NSERC grant and an Alberta Ingenuity grant to help offset her school and living expenses. Keeping such a demanding schedule has taught her the art of efficiency. "I'm more efficient with my time," she says. "When I work, I can be really focused."

The same no doubt applies to her training.





Squirrels Have Personality

A red squirrel mother's personality has an impact on her offspring's ability to survive, researchers have found.

Adrienne Boon, who recently completed her MSc, wondered if squirrels had different personalities and if so, did it affect the survival and growth of offspring over multiple years.

She found that red squirrels do indeed have different personalities, ranging from very aggressive and very active to more passive and less active. She also found that a mother's personality does affect her offspring. "The offspring of active mothers tended to grow really fast in years where there was a lot of food," she says.

If natural selection were ruled solely by genetics, this finding might suggest the red squirrel population would become more and more aggressive as time went on. But Boon found that's not the case. "In years of low food, it was the offspring of inactive mothers that tended to grow faster," she says, adding the variability in food supply helps lead to the maintenance of both aggressive and passive individuals in the red squirrel population.



Research found that the personality of a mother's red squirrel has an impact on her offspring

Supplied

Findings Lead to New Geological Map of Canada

Geologists from the University of Alberta have found that portions of Canada collided a minimum of 500 million years earlier than previously thought, a finding that rocked the world of Canadian geology.

Graduate student Michael Schultz, the lead researcher on the project, explored the Queen Maud block of Arctic Canada, a large bedrock terrain that is said to occupy a keystone tectonic position in northern Canada. "In terms of trying to figure out how Canada formed, this block held a lot of secrets," said Schultz.

The U of A team discovered that the sedimentary basins within the terrain, and the age and timing of high-temperature metamorphism of the rocks found there, challenged previous models. "Every time we did an analysis, it gave us a new piece of information that was nothing we were expecting, based on what was known in the geological community," said Schultz.

Schultz credits cutting-edge technology only recently developed in the department of Earth and Atmospheric Sciences at the U of A with the ability to acquire large amounts of data from

rocks of the Queen Maud block in record time. The technique, known as in-situ laser ablation, substantially reduces the preparation time for geochronology, the process of dating rocks and minerals.

Their research, published in the American journal *Geology*, is offering new insight into how the different continental fragments of North America assembled billions of years ago.



Michael Schultz's findings suggest portions of Canada collided at least 500 million years earlier than previously thought

Supplied

Awards and Accolades

The Faculty of Science is, without doubt, one of the best in the country. In fact, a BSc is the most sought after degree in the province. One important reason for our success is the quality of our faculty members and staff. They routinely receive prestigious international, national, provincial and university awards that recognize their excellence in research and teaching. Congratulations to all the award winners.



George Pemberton

International

Mark Boyce of Biological Sciences was named the *Safari Club International's Conservationist of the Year...* Chemistry's **Rod Wasylshen** was made a *Fellow of the American Association for the Advancement of Science...* **George Pemberton** of Earth and Atmospheric Sciences won the *Grover E. Murray Memorial Distinguished Educator Award* from the American Association of Petroleum Geologists... **Benjamin Rostron** also of Earth and Atmospheric Sciences, was awarded a *Geological Society of America Fellowship...* Computing Science's **Russ Greiner** was named a *Fellow of the Association for the Advancement of Artificial Intelligence...* **Dennis Hall** of Chemistry was awarded a *Humboldt Research Fellowship*.



(l to r) David Bundle, Margaret-Ann Armour and James Pinfold

National

Three of our faculty members were made *Fellows of the Royal Society of Canada*: **Larry Heaman** of Earth and Atmospheric Sciences, **Richard Palmer** of Biological Sciences and Computing Sciences' **Jonathan Schaeffer**... Chemist **Jillian Buriak** received an *E.W.R. Steacie Fellowship*... **George Pemberton** and **Murray Gingras** of Earth and Atmospheric Sciences each received the *Canadian Society of Petroleum Geologists Medal of Merit*... Faculty members were well represented when the *Geological Association of Canada* handed out its awards: **Jeremy Richards** won the *W.W. Hutchison Medal* and **Robert Creaser** was awarded a *Distinguished Fellowship*. **Hong Zhang** of Computing Science won the *Canadian Information Processing and Pattern Recognition Society Award for Research Excellence and Service to the Research Community*... Chemistry's **Yungie Xu** won a *Petro-Canada Young Innovator Award*... Two faculty members received a *Killam Annual Professorship*: Chemistry's **Rod Wasylshen** and **Russell Grenier** of Computing Science. **Pierre-Nicholas Roy** of Chemistry won the *Keith Laidler Award*.



Jillian Buriak

Provincial

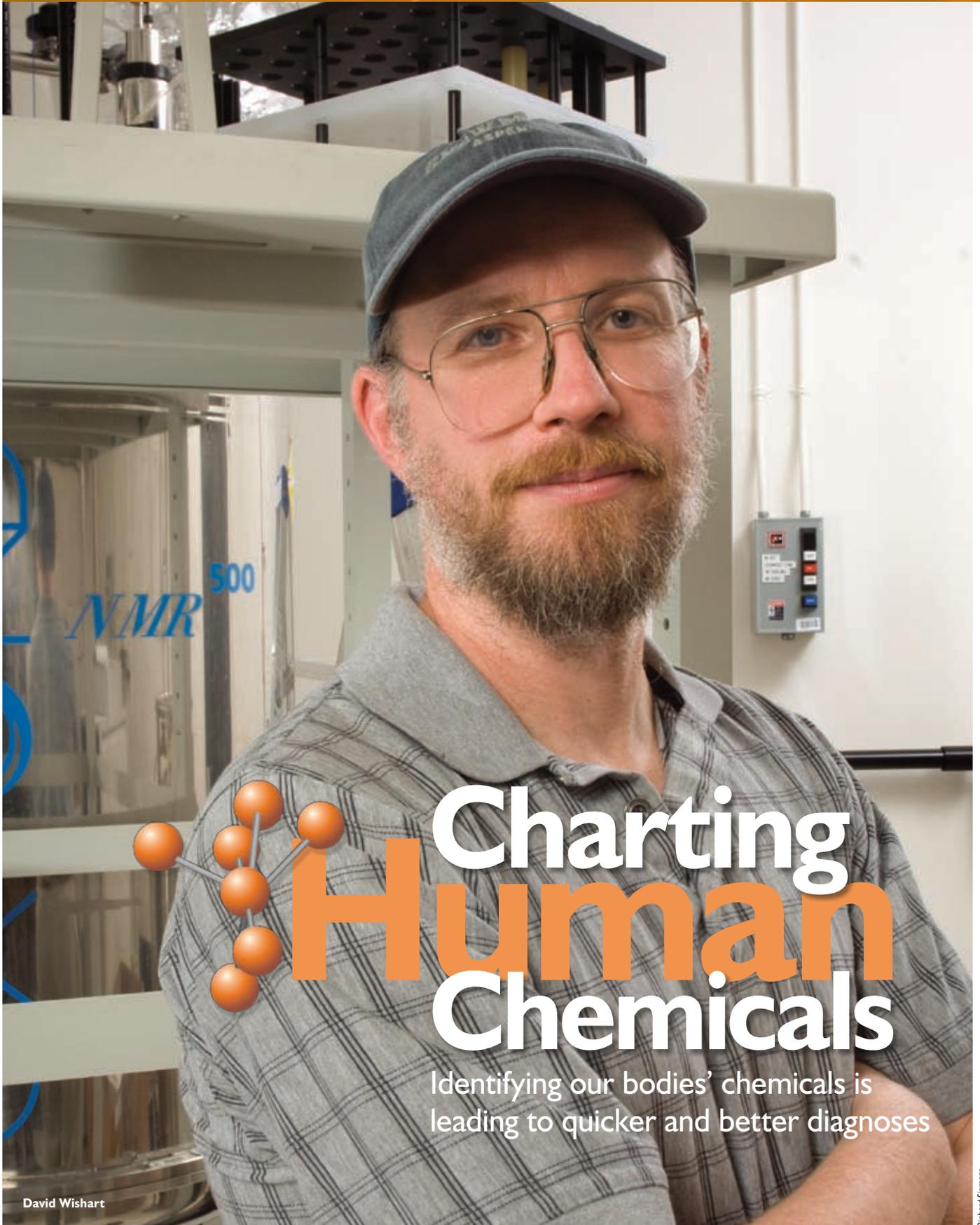
Faculty of Science members were up for three awards at the recent Alberta Science and Technology Leadership Foundation Awards as Chemistry's **David Bundle** was awarded the *Outstanding Leadership in Alberta Science Award* and Physics' **James Pinfold** won the *Excellence in Science and Technology Public Awareness*. Associate Dean of Diversity **Margaret-Ann Armour** was honoured with the *ASTech Foundation Special Award*.



(l to r) Paul Sorenson, Kip Barton and Nat Rutter

University

Two faculty members received alumni awards this past year. Professor Emeritus **Nat Rutter** of Earth and Atmospheric Sciences received the *Distinguished Alumni Award* while Vice-Provost and Associate Vice-President **Paul Sorenson** (Computing Sciences) won the *Alumni Honor Award*. Another professor from Computing Science, **Xiaobo Li**, won the *Rutherford Award for Excellence in Undergraduate Teaching* while **Zbigniew Gortel** from Physics received the *Students' Union Award for Leadership in Undergraduate Teaching*. Two *McCalla Professorships* were awarded this past year to science faculty: **Mark Lewis**, who holds a cross-appointment between Mathematical & Statistical Sciences and Biological Sciences, and **Al Meldrum** from Physics.



Charting Human Chemicals

Identifying our bodies' chemicals is leading to quicker and better diagnoses

David Wishart

Richard Siemens

For over a decade, David Wishart's cousin knew there was something wrong with her health. Her doctors knew it too. But no one knew exactly what it was. In fact, Wishart's relative was misdiagnosed for 15 years until they finally found the right answer. She had Fanconi's syndrome, a kidney disorder.

A year later, Wishart was preparing to give a lecture to pharmacy students on why nuclear magnetic resonance, or NMR, would be useful to pharmacists, clinicians and others in the medical community. "I was reading a paper (that) was showing an NMR spectrum of urine of someone who had Fanconi's Syndrome," he explains. "I looked at the spectrum below that one which was one of a person with normal health, and the spectra were just remarkably different. It was obvious. I thought, 'If they'd only been able to collect just an NMR spectra of the urine 15 years previously, they would have been able to diagnose it right away.'"

Thus began Wishart's mission of identifying all the chemicals or metabolites in the body in order to better detect diseases of all kinds, more rapidly and more accurately for – it turns out – very little money.

NMR is a way of looking at molecules or chemicals by measuring their magnetic energy, imperceptible by the human eye. "It's actually radio waves," Wishart explains. "What we're detecting are events that happen around the nucleus of the atom or molecule. That's why it's called nuclear. It's not radioactive." While the magnetic energy that is absorbed by the molecule is very weak, it can nonetheless have a very powerful impact on our health.

To date, Wishart and his team of 25 on the Human Metabolome Project



Dr. David Wishart, pictured putting a bio-fluid specimen in an NMR, and his team identified more than 2,800 chemicals that our bodies produce.

have identified about 2,800 metabolites, chemicals that our bodies produce and need to stay alive. They've identified them mostly by scouring any and every scholarly paper they could find on the subject of any metabolite.

"The interesting thing is that the human metabolome was basically completed five years ago, even before we started the project," says Wishart who holds a cross-appointment with the departments of biological sciences and computing science. "It was the case where thousands of labs had been toiling away at this, publishing in little pieces, unconnected, unaware of what the others were doing."

Wishart and his team brought all the information together and created databases cataloguing the list of compounds. They also went over and above by describing the diseases the compounds are associated with, the biochemical pathways they use and the genes that affect them.

The effort complements the work done on the human genome and may turn out to have a more significant impact on our health care than its better known cousin, the genome.

"Not all diseases are caused by genetic defects," explains Wishart. "The metabolome reflects your interaction with what you've eaten, what you've been breathing, what might be infecting you, be it a virus or bacteria, all those things that are external that are very, very rapidly detected or affected by the metabolome. So clinically, it's a lot more

useful to figure out what's happening in the body."

Wishart points out that most diseases have a genetic and an environmental component, even those diseases we most often attribute solely to genetics, like cancer. "There are things like liver cancer, (which is) primarily caused by a virus. Cervical cancer is caused by another virus. So while cancer is officially labeled a genetic disease, probably 90 to 95 per cent of it is environmental," he says.

All told, there are about 2,000 diseases affecting human beings. No one really knows how many are genetic or environmental or both. Wishart is under no illusion that he'll be able to study every disease. But by cataloguing all the chemicals as he and his team have done, other scientists can look at their favorite disease and see if they can find markers for it or places for improving the diagnosis or prognosis.

That work has already begun as scientists are using data from the Human Metabolome Project to come up with metabolic profiles for a variety of issues such as identifying organ rejection or better methods for diagnosing lupus, rheumatoid arthritis or pneumonia.

And it makes the reality of going to your doctor and getting a lot more health information from your urine or blood sample that much closer.

And then, perhaps, those stories we've all heard about someone who had a medical problem that the doctors just couldn't figure out, like Wishart's cousin, will be much less common.



Dawn of a **new industry?**

U of A creates space institute, opening opportunities in space research

Chris Herd and Ian Mann

Michael Holly

When engineering professor Carlos Lange was working on a proposal to build a meteorological station on a Mars-bound lander, he needed the help of a wind expert. As a member of the newly-created Institute for Space and Scientific Exploration and Technology, Lange called a fellow member, Chris Herd from Earth and Atmospheric Sciences. Lange explained to Herd that he needed someone who could help select the proper sets of instruments to measure the velocity of the atmospheric winds on the red planet. Herd suggested Lange contact John Wilson of Earth and Atmospheric Sciences, who has measured wind pretty much everywhere on Earth. The two researchers met and decided to collaborate on the project.

And that's the major value the space institute at the University of Alberta provides, according to Herd and physicist Ian Mann, co-directors of the institute. It brings together experts from a variety of space-related and other relevant fields and creates the infrastructure to put together the personnel with the skill sets to pursue major projects.

Another example is ORBITALS, a Canadian-led mission that recently was granted \$1.7 million in initial funding from the Canadian Space Agency. The mission's goal is to better understand space weather in Earth's outer atmosphere, explains Mann, leader of the project.

The reason is simple. It would be better for commercial satellite providers to position their satellites closer to Earth than where they are now, about 35,000 kilometres from Earth's surface, in geosynchronous orbit. If the satellites were closer, they could generate a global view of the planet with a smaller number of satellites.

The problem is the environment of the area – from about 6,000 to 30,000 kilometres or so from Earth's surface - is

poorly understood. Scientists know it is filled with radiation and that its weather can be as wide-ranging as it is here on Earth. There are beautiful, calm days and there can be severe storms, space's equivalent of a category 5 hurricane, which can destroy satellites. Scientists even know how space storms cause damage: through particles that are accelerated to fractions of the speed of light. What they don't know, and what Mann hopes to find out, is how these satellite "killer" particles are created. "If we can understand the physics of how they're

fundamental of the next phase which would make ORBITALS the first Canadian-led mission with participation from the American space agency.

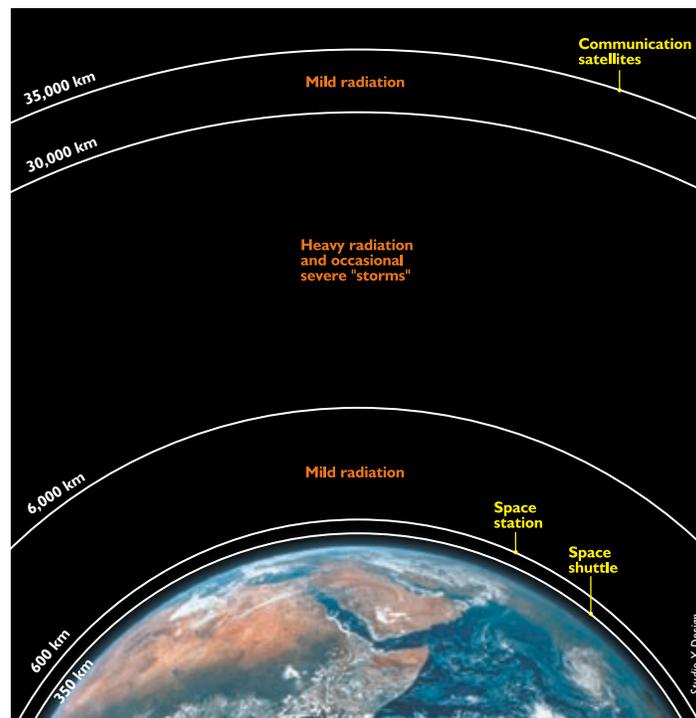
To get ready for the ORBITALS mission, which is anticipated to be launched in 2012, Mann and his team from academia and industry are currently designing the satellite and the six Canadian instruments required to take the data from the harsh conditions of the outer atmosphere and relay it back to Earth. If all goes according to plan, an additional four instruments will be provided by US colleagues with NASA funding.

A company is designing one of the instruments while researchers Andrew Yau and David Knudson from the University of Calgary are working on a particle measuring instrument for the project. Three other instruments are being designed here at the U of A between several researchers while the sixth instrument is already developed and flight proven. "The expertise has meshed together nicely," says Mann. "Different expertise in Alberta and elsewhere in Canada, both in universities and industry, has complemented each other's instrument-building capacity."

Mann and Herd see ORBITALS as the type of exciting project for which

the Institute can help researchers compete. "To bring people together and leverage that expertise is absolutely the way forward," says Mann. "We already are individually playing important roles in missions going to Mars and various other space-based projects. What we want is to make sure we have the infrastructure to compete for these projects and to trail blaze space science research in Canada."

And when that day comes, the spinoffs will be of great value to Alberta. In fact, the researcher believes it could be the start of a new industry in Alberta. "There's no reason, if this develops, that space companies shouldn't have premises and facilities in Alberta."



created then we'll be better able to protect future space assets," he says.

Satellites used to create the Global Positioning System are in the outer atmosphere and are built to withstand its harsh environment. However, the commercial satellite industry in general is reluctant to use the area for communication purposes, such as television signals, pager signals and the like, because of the uncertainty of the radiation environment. There is an international effort underway to better understand the outer atmosphere and ORBITALS is a key Canadian contribution.

If the team is successful in this initial design phase, NASA may be one of the

Finding Purpose

How one alumnus turned grief into helping thousands of people



Dr. Chandler's wife Manjari, and children, daughter Sarada and son Srikiran

Asha Rao remembers vividly hearing the story of a long-time family friend in the late 90s. The friend was Dr. Chandra Sankurathri, or Dr. Chandra as he is better known, a man who earned his PhD in zoology from the Faculty of Science in 1974. Rao's father had invited him to their house to tell his story to about a dozen people. And what Rao heard that day so moved her, it eventually compelled the current administrative professional officer in the department of psychology to spend her holidays last year volunteering in India.

Dr. Chandra's story begins on a Saturday in June 1985. He drove his wife and young son and daughter to the Mirabel International Airport as the family was going on holidays to India. Dr. Chandra, however, couldn't leave right away. The plan was for him to join them in the following days.

Air India flight 182 was delayed several hours and Dr. Chandra, who was living in Ottawa at the time, returned home in the early hours on Sunday. That morning, he was awoken by the sound of his doorbell. Friends came in and sat. "Nobody said a word," says Dr. Chandra. "I had no idea what was going on and then someone said, 'did you hear?'"

There had been a bomb on Air India flight 182, ripping the plane apart as it flew over Ireland. All 329 passengers and crew died.

"I was in disbelief," says Dr. Chandra. He went to Ireland



Children at the school receive a new uniform



Dr. Chandra looks on as a doctor examines a patient



Dr. Chandra teaches a class under a mango tree

to see the wreckage, to find his family. "I never saw the bodies," he explains. "In the back of my mind, they were still on holidays. It took me a long time to accept they were gone." Dr. Chandra says it took him three years to come to terms with the tragedy of losing his family. He continued to go to work every day as a scientific evaluator of medical devices for what was then Health and Welfare Canada. But at night, when he came home to an empty house, he was extremely lonely. "There was a big void. I wondered, 'what am I supposed to do?' I did a lot of soul-searching."

Before her death, Dr. Chandra and his wife sometimes talked about how they could help children, specifically orphans. He decided that he would try to help orphans. He thought about going to Africa but ultimately decided, much to the dismay of his friends and colleagues in Canada, to go to his wife's home state of Andhra Pradesh, an impoverished area in southern India. "They all told me not to do it," he says. "I had already changed my values. I was more a westerner than Indian. But I knew it was what I wanted to do. I had to quit my job." And so he did. He took the pension money he had accumulated as a federal civil servant and in the summer of 1988, he went back to India.

He started a foundation in Ottawa to accept donations, bought land in Andhra Pradesh and started building a house. By the time the house was ready in 1990, construction for the orphanage began with a two-year timeline. Everything was going according to plan when Dr. Chandra noticed a bunch of kids working in the fields. Curious, he asked them why they weren't in school. They told him that their parents put them to work. He asked if they were interested in studying. To his surprise, they all said yes. "We started the next day, in the evening, and I had 25 kids.

We started with the alphabet, then numbers. They never missed a class. I was so amazed. I was really, really surprised to see how motivated they were at that time. They opened my eyes. That really made me think of the needs of the community."

And so Dr. Chandra's mission changed and the Sarada Vidyalayam school, named after his daughter, opened. "Why bother opening an orphanage and helping maybe 10 to 15 kids in my lifetime?," he asks. "If I help kids get an education, I could help 20 to 25 new kids every year." Today, the school educates 125 kids from grades 1 to 8. Next year, the school will add grade 9 and the year after that, grade 10, which is the end of high school in India.

But that wasn't the end of Dr. Chandra's new purpose. In 1993, a year after officially opening the school, he opened an eye hospital – the Sriikiran Institute of Ophthalmology, named after his son - with the help of a childhood friend who worked as an ophthalmologist in the U.S. "He always wanted to do something in India," explains Dr. Chandra about his friend. "I suggested we start an eye hospital. He said, 'O.K.'"

Cataracts are a major health issue in that part of India and the hospital performs about 15,000 surgeries a year now, up from the 450 or so it performed in 1993. "It's just a small dent in the problem," says Dr. Chandra. "There are 19 million blind people with cataracts in India and they don't have to be blind at all."

When Dr. Chandra comes to Canada these days, he tries to meet as many people as possible, gives presentations and looks for funding. It costs only \$50 to perform a surgery and restore sight to someone and that covers everything from transportation to the hospital, the

initial consultation, the surgery itself and all the post-operative care and drugs. "It's such a gratifying thing," he says. At the same time, it costs only \$125 to see a child through one year of school, including meals and the uniform.

When Asha Rao went last November, the former high school teacher who has a BE and a BComm helped in various grades. "I could see the genuine joy in Dr. Chandra seeing the kids succeed," she says. "It's very disciplined in how it's run. The kids have a pass rate of 100% and an average mark of over 90% in government exams which is a very high success rate. These kids really yearn to learn."

But perhaps what struck her most was when she had the opportunity to go out with the hospital outreach workers and medical staff that went to a small village of about 5,000 people 45 minutes away from the hospital. "All I saw was a line of people, a whole row of people lined up for assessments. These outreach workers would often bring back 200 to 300 people for surgeries. I remember how it was changing lives. People that couldn't see, the next day they would have clear vision."

She also saw first hand the extreme poverty in which many of these people lived. "I had never really been exposed to that. It was heartbreaking." Rao has volunteered for many causes in her life and continues to do so. The experience in India re-enforced her belief that she really can make a difference, even if it's only one day at a time.

For his part, when Dr. Chandra sits in his house in the evening and sees the hospital on one side and the school on the other, he's happy. "I forget all my memories, I forget all my problems," he says. "It gives me such joy, such happiness to see that I'm able to help, at least some people, to make their life a little bit better. What else can I want more than that?"

For more information about the Manjari Sankurathri Memorial Foundation, visit www.msmsf.ca.



Dr. Chandra counsels patients who have undergone cataract surgery



Children from the Sarada Vidyalayam School



Patients wait to be examined at an eye camp

Photos courtesy of Manjari Sankurathri Memorial Foundation

BP Canada Funds Dinosaur Digs

A keen advocate for education and scientific advancement, BP Canada was eager to partner with the Faculty of Science to fund the Palaeontological Field School Program, contributing \$90,000 over three years.

The funds were used to explore three sites this past summer, one in Grande Prairie, another one in Dry Island Provincial Park and the third one in Edmonton where a dinosaur bonebed uncovered some new information about the ancient world of dinosaurs.

World-renowned paleontologist Dr Phil Currie and his team discovered fossils of plant-eating *Edmontosaurus* and *Sauroplophus* as well as teeth from *Daspletosaurus*, the direct ancestor of the mighty *Tyrannosaurus rex*, at the site this year.

"We weren't expecting it," he said. Currie explained that *Edmontosaurus* and *Sauroplophus* had never been found together before. "It means they were here at the same time. It's a new discovery."

Currie and his team believe the *Edmontosaurus* and *Sauroplophus* roamed in herds and that a natural disaster killed those found at the site. And that's where the *Daspletosaurus* came in. Finding teeth from *Daspletosaurus* means the meat-eating dinosaur used the spot as a feeding area. Graduate student Phil Bell explained it was likely attracted to the easy meat of the dead plant-eating dinosaurs.

At each of the three sites, BP international volunteers participated. "These digs are an opportunity to learn first-hand from top paleontologists – and the paleontologists of tomorrow – while helping to enhance the body of knowledge about Alberta's palaeontological past," said Anita Perry, BP Canada's vice president of government and public affairs.



Anatomy of an Endowment

When Robin Leech put a proposal forward to the board of the Alberta Society of Professional Biologists in 2003 to fund a scholarship for a graduate student in biological sciences, he offered to have the money come from his own salary.

There was bit of hesitation around the table until one of the members said, "He's giving you the way to do it. Vote!"

And so the association approved the proposal to provide \$2,500 scholarships.

"I still get a kick out of that," explains Leech, the executive director of the association.

The association had been providing \$1,000 scholarships to undergraduate students to three Alberta universities for about 15 years and then \$1,500 scholarships for three or four years when Leech decided to take a look at their philanthropic endeavours. He found that of the about 60 students who had been awarded a scholarship, only one had joined their association.

"The scholarships were going to the students with the best marks, regardless of their interest for biology. I thought we could put the money in a better place for us, for biology," explains Leech.

Thus, he made his proposal that carried the day. Since then, Leech heard of the endowment program whereby if a donor puts up \$25,000, the government will match it over time, creating a pool of \$50,000, enough to generate approximately \$2,500 in interest a year and fund a scholarship in perpetuity.

"We took that to the board," says Leech, "and someone said, 'This is a no-brainer. Let's get going.' I couldn't be more pleased."

Along with the University of Alberta, the University of Calgary and the University of Lethbridge will also receive funds to create graduate scholarships.

Continuing the Cycle of Support

"You see that line?" asks the kindly, retired professor as he points to a section in his resume that states 'Imperial Oil Research Fellowship, 1952-55.' "If it wasn't for that scholarship from Imperial Oil, there's no way I would have a PhD. That support made it possible."

And that timely support is the main reason Dr. Ronald Burwash and his wife, Ruth, decided in 1999 to endow a scholarship.

It started when a "very persuasive fellow" from the University's Development Office suggested he set up a scholarship and contribute \$1,000 a year to it. Burwash and his wife chose instead to endow the scholarship by contributing \$10,000 which provided an annual award of \$500.

The couple stipulated the recipient was to be a 2nd year student with a good academic record and skill in English.



"My wife is a U of A graduate. If you have all this knowledge and can't communicate it, what's the use?" asks the man who won the Faculty of Science Award for Excellence in Teaching in 1989. "We feel that having communication skills is very, very important."

The Burwashes have continued their donations, with a goal of endowing an annual award of \$2,000. "Students can't pay their fees on a summer job anymore," says Burwash. "They go into such debt. If we help students move on with a little less debt when they graduate, that's great."

Nurturing Home Grown Talent

The facts produced a compelling argument.

Over the last five years or so, the biotech industry in Alberta has grown 10 to 15 per cent annually. That rate of growth is expected to continue for the foreseeable future. The best way to find employees to fill the hundreds of jobs that are created every year is to grow them here.

"The reality is it's a little tougher to attract people from outside Alberta to come into our industry," explains Ryan Radke, executive director of Bio Alberta. "What we need to do is shape those people here."

To that end, BioAlberta decided to create a Rising Star scholarship for a

third of fourth year student who has superior academic achievement, is doing a major in biological sciences and a minor in business.

"We knew we wanted to support the science grads but we're also looking to make that mesh between science and business," says Radke, explaining that there are a lot of people who don't just want to work in the labs, they also want to be able to work on the business side of science.

"Supporting well-educated and innovative graduates is key to the growth and success of Alberta's knowledge-based industries," comments Radke. "We see it as critical to the diversification of our economy; that's why we are involved."

Timing Right for First Rising Star Scholarship Donor



Margaret Berg and Anna-Kristen Siy

Margaret Berg decided it was time.

When the 1952 science graduate read an article in *Science Contours* describing the Faculty of Science's Rising Star Scholarship program, she decided it was time to make a gift in her name.

"When you have five grandchildren who are in or have gone through post-secondary education, you realize how much a scholarship means to them," says Berg, who was the first donor to fund a scholarship under the Rising Star program.

When Margaret Berg graduated, she followed her husband, Roy, to Minnesota where he pursued graduate studies. While there she worked as a lab technician in animal physiology. In 1955, when he completed his PhD, the couple returned to Edmonton and Roy took a faculty position at the University of Alberta. Margaret raised their four children, teaching them responsibility to their community and a love of science. All are graduates of the U of A.

Berg is a familiar name on campus at the University of Alberta as Roy Berg was a professor and served for a time as dean of the Faculty of Agriculture, Forestry and Home Economics.

A master weaver, with 40 years of experience, Margaret used her chemistry skills when she founded and ran a yarn dyeing company with a friend for about a decade.

Son Sets Up Scholarship to Honour Helping Mother

War displaced Benjamin Lu and his family in China but the bonds his mother created with two young girls survived World War II and decades of separation.

Among the Lu family's circle of friends were two single mothers, each of whom had a daughter. Benjamin's mother took both girls under her wing, helping them as she could. The girls affectionately called her Mama Lu. "I got to know them as they were frequent guests at my home," explains Benjamin Lu.

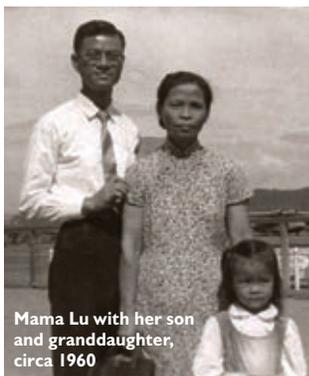
In late 1949, as the civil war in China raged on, the Lu family moved again, this time to Taiwan. True to her character, Mama Lu – who worked as a kindergarten teacher - helped another less fortunate young girl however she could. With her husband's help, Mama Lu saw the girl through college.

Mama Lu and her family lost touch with the two young girls she helped in China. Recently, however, these two

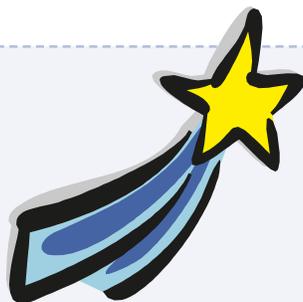
women found Benjamin Lu, who had retired as a professor from the University of Guelph and contacted him. He was overjoyed. Unfortunately, his mother had passed away in 2003.

To honour the memory of her mother, Benjamin Lu, who earned his MSc and PhD at the U of A, set up a scholarship in his mother's name. The

Mama Lu Rising Star Scholarship provides a first-year student with \$1,000 for his or her studies. To make the scholarship permanent, Benjamin will endow it by donating \$12,000. Those funds will be matched by the provincial government, in time, doubling the amount of the gift. The interest from the \$24,000 will provide the \$1,000 scholarship in perpetuity.



Mama Lu with her son and granddaughter, circa 1960



Rising Star Scholarships

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Pushing the boundaries of
**artificial
intelligence**
What we learn through

Phil Laak was one of two world-class poker players to take on the poker software developed by computer scientists at the University of Alberta

“Excuse me,” says the computing science professor as we meet in his office. “Two hours off e-mail...” His voice trails off but the implied message is clear. E-mail simply must be checked before we can move on.

Jonathan Schaeffer admits to a little obsession-compulsion. How else can you explain the fact he spent 18 years on a project, albeit one that resulted in the biggest artificial intelligence problem ever optimally solved. It was the first of two significant events that Schaeffer would be a part of this summer.

The chair of the computing science department was at the end of a business trip late last April and about to begin a brief weekend holiday with his 15 year-old daughter. He entered his hotel room in Santa Cruz, California and, true to his nature, started his laptop and logged in to his checkers research site. By the time he was in, it was 6:05 p.m. local time.

“When I logged in to check on the status, I saw that everything had stopped,” recounts Schaeffer. “I thought at first, ‘Oh damn! Things have crashed. There’s been a power outage. Something is wrong.’ Then I checked the log file and it said, ‘Draw.’” The message had appeared at 6:03 p.m., local time.

What it meant was that he had solved checkers. No matter how you played against the software, the best you could do is draw. Schaeffer had finally reached the finishing line on an 18-year project.



Michael Johanson

Jonathan Schaeffer with his daughter, years ago. Now 15, she was the first to congratulate him when he solved checkers.



al nce h games

Morgan Kan

Oddly enough, the programmer analyst on the project, Neil Burch, also logged in at the same time. "We both happen to be logging in at the same time as the computation was ending. That was just weird! I'm not superstitious or believe in psychic phenomena but nonetheless it's a remarkable coincidence. And, of course, I was stunned. I knew it was going to finish soon but I hadn't expected it then."

When the story hit the media that checkers had been solved, part of the reaction was predictable: it had been a massive waste of time to solve a silly little game. But what these commentators didn't understand was the impact solving such a huge problem has on the field of computing science and artificial intelligence.

"We published a bunch of papers, we have some new algorithms, new compressions, all that sort of stuff," explains Schaeffer, "but to me that not's the big event." The big event is the sheer size of the computation. To solve the game, the computer had to sift through 500 billion billion possibilities.

"That is a massive number," explains Schaeffer. He's not kidding. It's 500 quintillion or 5×10^{20} . It looks like this: 500,000,000,000,000,000,000. "That number is out of reach for most people's imagination. It's opened people's eyes to be able to do problems that are much bigger than ever been solved before."

But that remarkable achievement was just the beginning of Schaeffer's excellent summer. In July, he was busy on a different but equally high-profile project. This one started in 1997 when he and Darse Billings started a computer poker research group that developed a software program called Polaris. By 2007, the group had expanded to about a dozen people, led by Michael Bowling. The time had finally come to test the software against two of the best poker players in the world, Phil Laak and Ali Eslami in a man versus machine showdown in Vancouver.

While Schaeffer and the poker research group thought the software was very good and capable of playing against world-class players, they really had no idea how it would measure up against these players. "There's a very important lesson I learned long ago when you're dealing in artificial intelligence," explains Schaeffer. "There's a big gap between what you see in the research laboratory versus what you see against humans."

The group chose three of its 10 different poker programs to play: Mr. Pink, Mr. Orange and Coach. The stage was set for the two-day event. There would be four matches, two each day, one in the afternoon and one in the evening. One player would play against the computer in front of an audience while the other player would be in a closed room. Both played the same program. The hand one player received was the hand the computer received with the other player.

On the first morning, the poker group put forward its Mr. Pink program. "We thought (Mr. Pink) was our best program and it did OK and we drew the match," says Schaeffer. "Then, as a lark, we put in this second program, (Mr. Orange)."

Two weeks before the showdown, a member of the group, graduate student Mike Johanson, wondered, "What if you tricked the poker software into believing there was more money in the pot than there actually was?" Turns out the program played very, very aggressively. "It just kicked butt," says Schaeffer. "It was brutal. The humans just had extraordinary difficulty with it. It was extremely aggressive. Everyone started calling it Agent Orange and that's what we call it to this day."

In that second match, the software won. 1-0 for the software.

On the second day, the group put in their Coach program, the one program that actually learns as it plays. Unlike Mr. Pink and Agent Orange, which are static programs or programs that play the same way, Coach watches the opponent and adapts its play using several different programs. But on this day, the coach program didn't work. "It broke," says Schaeffer. "It had a bug and it got stuck on one program. And we lost. We lost narrowly, but we lost."

For the final match, the group asked the players which program they wanted to play against. They chose the first program they played against, Mr. Pink. "They felt they could beat Mr. Pink," says Schaeffer. "The interesting question to us was, 'Have they learned enough to beat Mr. Pink?' I don't know what they learned but they played very well and they won that fourth game, fair and square."

And so, on this day, the humans won... the two matches and the overall competition.

Although the software lost, the researchers gained valuable insight. They now know that their software can compete with world-class players, a milestone in and of itself. But where they were hoping to make the biggest contribution will have to wait. With the Coach program broken, the group wasn't able to see how their learning software performed.

It would have been fascinating to see how the Coach program would have performed because, while there are other software programs that can learn, they are usually slow at doing so, certainly too slow to compete against humans. The hope was that the Coach program could learn quickly enough to compete against people.

But it'll have to wait for next year, when the second man versus machine poker showdown will take place, to see if the Coach program is the breakthrough in artificial intelligence the poker research group hopes it is.

"We're not groundbreaking yet," concedes Schaeffer, "but we've made progress."

Ali Eslami, centre, talks about playing against the poker software as Phil Laak looks on.



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Caroline McParland who earned her PhD in 2004, is working as an ecologist with a multinational engineering firm, Halcrow, in the UK. Her role includes ensuring that engineers design buildings, flood defences and roads in ecologically 'friendly' ways. She also advises others on UK and European environmental law and conducts research into the effects of water policies on freshwater ecosystems.

Barbara Hergott (Nowacki) of Edmonton, and her husband, Glenn Hergott, would like to announce the surprise birth of their son, Aleksander Jakob, in May 2006, who has been 18 years in the waiting. Barbara earned her BSc in 1985 while Glenn studied science at the U of A in the '70s and was part of the Delta Upsilon chapter during that time. He has been a certified financial planner for over 24 years and now works with Barbara (who worked for over a decade with Alberta Education in the National and International Education Division) running their own financial planning practice.

1973 BSc graduate **Mervyn Rogan** is currently living in St. Albert and is marketing manager for Target Products Ltd.

A safari vacation in 2004 gave 1989 MSc graduate **Leslee Greenaway** a new focus in life. While she continues to work in Edmonton as a realtor who specializes in character and heritage homes, she now considers Kenya her second home and does community development in a rural village in the African country.

'72 **Joe Ruggiero**, BSc, '74 BCom, '95 MBA, recently retired from Suncor Energy in Calgary and now provides advice on oil sand royalty matters. He and his wife, Marnie Ruggiero, '74 BEd, are planning to relocate to the Okanogan in the near future.

Helen S. Tymoczko earned her BSc in chemistry in 1974 before going to law school and enjoying a career as a lawyer in Edmonton. She recently completed serving on two federal boards, as chair of the CPP Disability Tribunal and as a member of the Canadian Egg Marketing Agency.

Arlen Todd was recently elected president of the newly-formed Canadian section of the Wildlife Society. Arlen earned his BSc in 1972 and lives and works in Calgary.

After 15 years as a clinical psychologist with the Correctional Services of Canada, **Douglas Boer**, who obtained his BSc in 1981, his MSc in 1983 and his PhD in 1989, is now teaching and directing the Clinical Psychology Programme at the University of Waikato in Hamilton, New Zealand. Doug and his wife Sasha have two children, Paul, 4, and Petra, 2.

Louise Horstman recently retired from running the public library in Morinville. Before that, the 1973 MSc graduate and avid birdwatcher ran her own biological consulting firm.

Lawrence Martz (BSc and MSc 1979) has been appointed Dean of the College of Graduate Studies and Research at the University of Saskatchewan, effective January 1, 2008. Lawrence, who received his PhD from the U of S, initially joined that university as a lecturer in 1984 and was named full professor in 1995. He has taught courses in geography, geomorphology, and cartography. His areas of research expertise include geographical information systems, hydrologic modelling, digital terrain analysis, soil erosion, climate impact on water resources, and computer mapping.



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