

# **WE SEARCH**

**ANNUAL REPORT  
2003-2004**



**WE SEARCH**

**FOR PEOPLE  
WHO DISCOVER  
WAYS TO IMPROVE  
OUR DAILY LIFE**

Alberta Ingenuity research is all about our world. It's about the food we eat, the way we communicate, the fuel we use, the protection of our environment and so many other things that touch us everyday. The people we support are making discoveries that will benefit us today and improve our world for future generations.

Our mandate is to nurture the discovery of new knowledge and encourage its application to benefit Albertans. Our support of world-class research will also advance science and engineering internationally. **We support people making discoveries.**

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**BUILT BY A  
STRONG SUPPORT  
FOR BRIGHT  
AND TALENTED  
RESEARCHERS  
WORKING IN  
KEY AREAS.**



Mr. Alvin Libin

Dr. Bill Bridger

As we celebrate the innovations that built our great province over the past one hundred years, we also look forward to a future filled with new knowledge and discoveries generated by outstanding scientists and engineering researchers based in Alberta.

Through our grants and awards programs, Alberta Ingenuity provides long-term investment in fundamental and applied research to answer questions essential to the lives of Albertans and people beyond our borders. We do this by funding only excellence in universities, colleges and technical institutes, and by helping Alberta industry compete with the best in the world.

In the coming years, Alberta will begin to reap the rewards of an increased research capacity built by this strong support for bright and talented researchers working in key areas. Among them, to ensure our precious drinking water supply stays safe and is plentiful; to develop ways to protect and preserve the health of our valuable forests, wetlands, and rivers; to sustain our natural energy resources; and to create technologies that will improve the effectiveness of wireless communications and medical treatments, and make the way we do business more efficient.

This 2003-2004 annual report to the community highlights the accomplishments of a few of the nearly 350 outstanding researchers, researchers-in-training, and students we support. It also features our three flagship Ingenuity Centres. These strategic Centres are attracting research stars from around the world who will tackle some of the most intriguing and complex questions in science and engineering.

As we move ahead, Alberta Ingenuity expects to attract more first-class researchers at all career stages and to encourage more smart young Albertans to

consider careers in fundamental and applied research. Prospects for new industrial research and the potential for commercialization of recent discoveries through existing Alberta companies and new spin-off companies are significant. With more high-quality research personnel at the ready, both public and private research enterprises will be well-positioned to grow their ideas and products. This combination bodes well for sustained economic growth and an improved quality of life for Albertans.

We thank our Board of Trustees for the valued experience and leadership they have lent Alberta Ingenuity over the past year. And on behalf of the Board, we extend our gratitude to our hard-working administrative staff, the dedicated members of our Science and Engineering Advisory Council who help guide our direction, and the many diligent peer reviewers whose input helps ensure a sound selection process.

We invite you to read on and make some discoveries of your own.

Mr. Alvin Libin  
Chair, Board of Trustees

Dr. Bill Bridger  
President and  
Chief Executive Officer



## PRODUCTS

## FOR HEALTHY LIVING

Our province is a major grower of oilseed crops such as canola and mustard and we are a leader in developing new crops such as safflower. This abundant production has helped make Canada a net exporter of consumable vegetable oils. Alberta scientists are now researching oilseeds as a possible reasonably priced and readily available source for creating vaccines to treat serious ailments, and topical creams and lotions for better skin care.

RESEARCHERS AMANDA BODERO AND CATHERINE Smith are part of the team discovering new methods of using plants to develop and harvest pharmaceutical proteins in a more efficient and more cost-effective way.

With help from Alberta Ingenuity's Industrial Associateship program the pair has spent the past year literally putting their scientific knowledge to work. Amanda and Catherine, recent PhD and MSc graduates respectively, are gaining experience conducting cutting-edge applied research at SemBioSys Genetics Inc., a Calgary-based biotechnology company focused on the development, commercialization, and production of protein-based drugs and personal care products derived from plants.

The distinctive nature of this research is the use of oilseed plants (typically safflower). Oilseeds are plant species whose seeds contain high oil or fat content (20-50%) used either for human and livestock consumption, or for industrial applications.

Other methods of developing proteins include lengthy and costly processes using bacteria and heat. The cheaper plant-based method has two steps. Amanda is designing ways to clone genes for the recombinant proteins that are inserted into the plants. Once the plants mature, she and Catherine analyze the seeds to determine how efficiently the protein has been expressed.

Both researchers were attracted to industry work because it allows them to apply their scientific skills in new ways. "Researchers in the early stages of their careers gain valuable industry experience through this program," Amanda says. "In turn, their employers also benefit from the unique skills and abilities that we bring to the work."

**Dr. Amanda Bodero and Catherine Smith are Alberta Ingenuity Industrial Associates.**

L to R: Catherine Smith, Dr. Amanda Bodero

## FOSTERING OUR FUTURE

Whether we are flying in an airplane or riding in a vehicle, the fuel that drives the engine relies on the production of oil. It is expected that Alberta's oil sands reserves will be the primary source for Canada's crude oil supply within a decade. With this demand and the potential economic benefit to Alberta, the need for more cost-effective and efficient methods of upgrading is critical.

DR. PEDRO PEREIRA ALMAO IS A WORLD-RENOWNED heavy oil researcher, and co-inventor and developer of two major technologies for heavy oil upgrading. His recruitment to Alberta from Venezuela with Alberta Ingenuity funding is a coup for the province.

Pedro came to Calgary last August and the timing couldn't be better. The oil sands of Alberta are an enormous resource, with recoverable oil estimated to be larger than the total reserves of Saudi Arabia. Many new oil sands projects, worth tens of billions of dollars, are underway. Upgrading — a set of processes that transforms oil sands bitumen into synthetic crude oil, which can be further refined into jet fuels, gasoline, and other petroleum products — is a key part of the industry.

Pedro hopes to use microscopic catalysts that can be easily dispersed even in heavy, viscous oil to do some upgrading while the bitumen is still in the ground (in situ). In situ production of bitumen may in the future replace open pit mining as the main source of bitumen production from the oil sands. In situ techniques inject steam into the deposit to heat the oil sands; the hot bitumen migrates toward producing

wells that bring it to the surface. The heat also helps create conditions favourable to the action of catalysts needed for in situ upgrading.

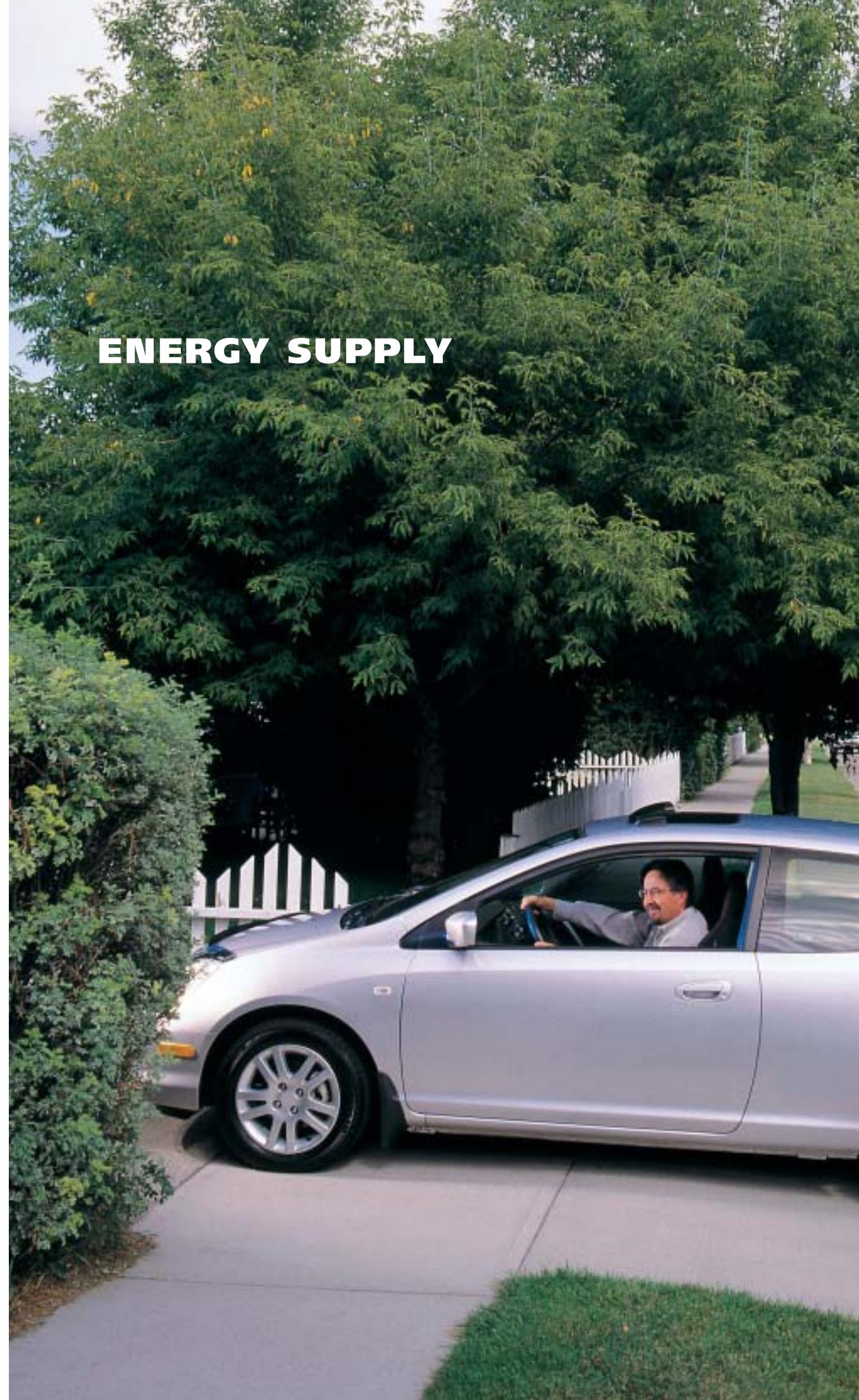
Pedro's other area of interest is in using catalysts to promote the absorption of asphaltenes (a part of bitumen), which can then be turned into hydrogen. Unlike smaller hydrocarbon molecules, bitumen is hydrogen poor. Upgrading involves adding additional hydrogen to make more valuable petroleum products. An asphaltene-based process to produce hydrogen could dramatically lower the cost of upgrading.

"Vital support from Alberta Ingenuity brought me to Alberta. It allowed me to set up a lab, put graduate students in place, and start my research program in a short time," he says.

**Dr. Pedro Pereira Almao is an Alberta Ingenuity Scholar.**

Dr. Pedro Pereira Almao

## ENERGY SUPPLY





## UNDERSTANDING

## THE NATURE OF SPEECH

Speech is at the heart of communication. Loss of speech due to stroke or brain injury can be devastating. A dedicated group of Alberta scientists is taking a unique approach to understanding speech and its connection to the brain and neural systems.

WITH ALBERTA INGENUITY FUNDING, DR. CHRIS Sturdy has set up a new lab and put key researchers in place to learn more about speech by studying communication behaviours and the natural history of several species of chickadees in Alberta.

Chickadees make a good model for learning about the human brain and speech because like humans, chickadees learn vocalizations — they are not born knowing how to sing or call. The birds' highly-complex calls warn about predators, tell others about food, and help them to identify members of their own species.

Alberta Ingenuity researcher Dr. Isabelle Charrier and research trainee Laurie Bloomfield work in Chris' lab studying note perception in chickadees. They conduct experiments that involve modifying notes — for example, slightly increasing their frequency — to see whether the birds can discriminate between the new-sounding note and the original note.

Dr. Andrew Iwaniuk, another Alberta Ingenuity recruit, has gained extraordinary insight into the capabilities of the brains of birds. His current research is focused on the neural aspects of behaviour in birds including

discovering which regions of the brain are used to learn vocalizations, identify the songs and calls of other birds, and produce the vocalizations that communicate a range of information. He looks for specific cells in the brain that are used for processing auditory signals, and producing and integrating sounds.

This kind of fundamental research on animal behaviour will provide a foundation for future research aimed at understanding which parts of the human brain are responsible for decoding vocal communication. Without this critical behavioural information, it would be impossible to conduct useful neurological studies.

**Dr. Chris Sturdy** holds an Alberta Ingenuity New Faculty Grant. **Dr. Isabelle Charrier** and **Dr. Andrew Iwaniuk** are Alberta Ingenuity Fellows. **Laurie Bloomfield** is an Alberta Ingenuity Student.

L to R: Dr. Andrew Iwaniuk, Laurie Bloomfield, Dr. Chris Sturdy, Dr. Isabelle Charrier

## PRESERVING

Whether it is reading the newspaper at home or loading the printer at work, we use paper in high volumes every day. With our wealth of forests, pulp mills are a major industry in Alberta. Reducing the impact waste generated by these mills has on our freshwater supply is the focus of innovative engineering research taking place in the province.

CURRENTLY, MOST CANADIAN PULP MILL OPERATORS treat effluents from their plants in settling basins and lagoons. A major drawback of this process is that it does not fully break down toxic compounds before they are discharged into rivers.

Dr. Mohamed Gamal El-Din is testing a process called advanced oxidization to treat effluents that may drastically reduce the amount of toxic compounds released into our water system. His research is a collaborative project with Alberta Ingenuity Centre for Water Research co-director Dr. Daniel Smith, a world leader in the field. Their work will lay the groundwork for the development of new ways to help industry meet increasingly stringent environmental regulations.

In the research, three methods (ozone, a combination of ozone and ultraviolet light, and a combination of

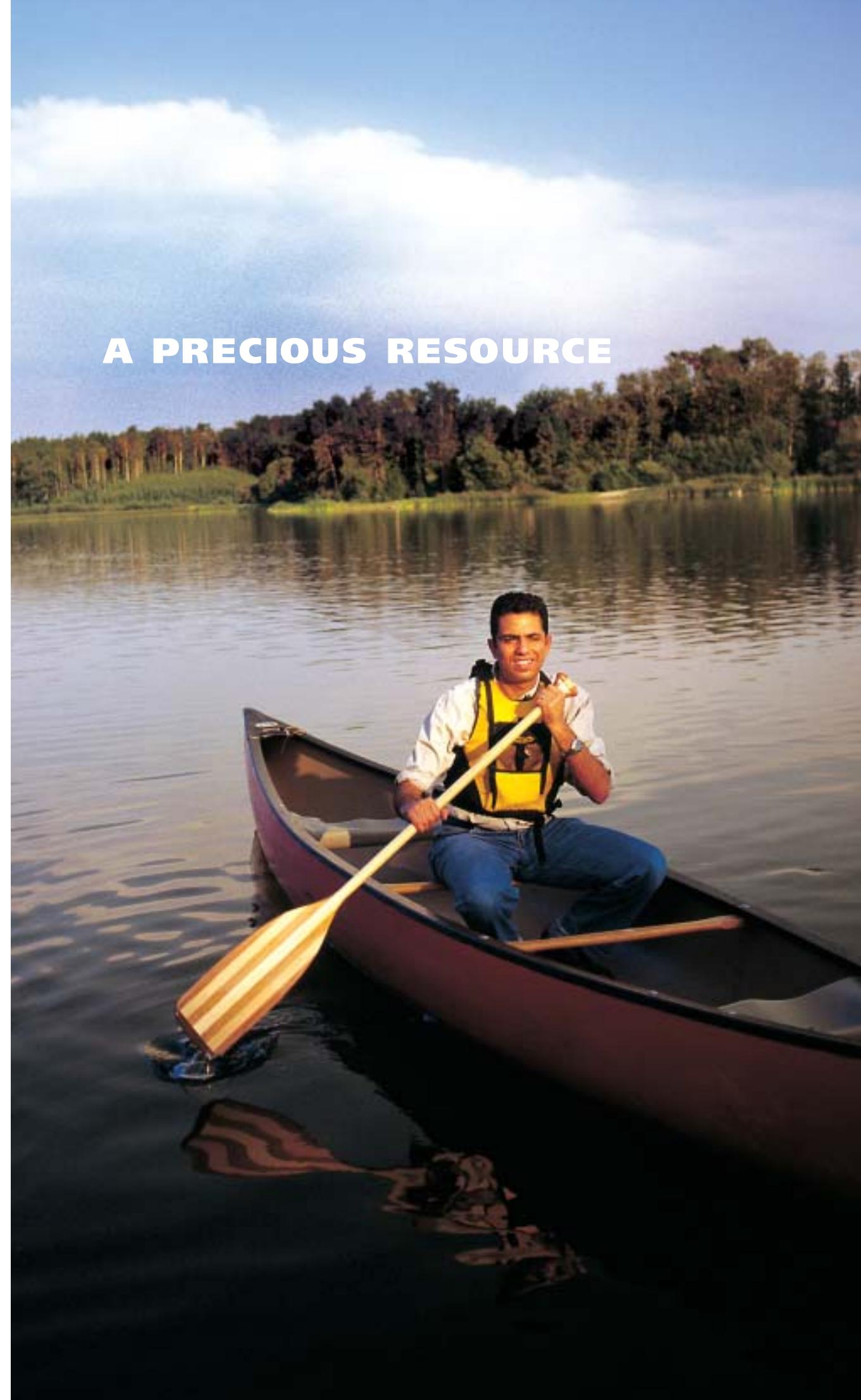
ozone and hydrogen peroxide) are used to break down resins and fatty acids (organic extracts released from wood fibres during the pulping process) to completely degrade harmful toxic compounds.

Mohamed says he chose to stay in Alberta because of the unique research advantages available here. "Alberta Ingenuity support allows researchers like me to pursue fundamental research that will help us to preserve and protect our precious water resources," he says.

**Dr. Mohamed Gamal El-Din holds an Alberta Ingenuity New Faculty Grant.**

Dr. Mohamed Gamal El-Din

## A PRECIOUS RESOURCE





## PROTECTING

## OUR NATURAL ENVIRONMENT

Marshes and swamps cover 25% of the land area in our province. These boreal wetlands are a critical component of the boreal forest ecosystem that among other things may help regulate our climate. A group of Alberta researchers is examining the impact climate change may have on the absorption and release of greenhouse gases from wetland regions in boreal forests.

BODIES OF WATER CONTINUALLY ABSORB OR RELEASE gases into the atmosphere as part of a naturally occurring process. Of particular interest to climate change research is the exchange of greenhouse gases (carbon dioxide and methane) involved in this process. As global temperatures gradually rise, the processes controlling gas exchange in bodies of water may be altered.

Wetlands are known to store large amounts of carbon dioxide. Climate change is predicted — but the effects not yet known — to cause the release of this gas, resulting in a possible acceleration in climate change.

Kyla Flanagan is meticulously mapping the processes that control the flow of these gases between wetland bodies of water and the atmosphere and studying the impact of climate change on these processes. To achieve this, she has simulated natural pond environments in two large greenhouses. One greenhouse is kept

slightly colder than normal temperature and the other greenhouse is kept slightly warmer than normal. As part of her work, she will record and analyze hundreds of test results that will provide a framework for gas movement and the impact of warming on the exchange of gases. This work will provide the basis for her Master's thesis.

Alberta Ingenuity's studentship program is allowing Kyla to gain critical full-time research training experience as she works toward her goal of becoming a scientist.

**Kyla Flanagan is an Alberta Ingenuity Student. Her supervisor is Dr. Ed McCauley, a Scientific Co-Director with the Alberta Ingenuity Centre for Water Research.**

Kyla Flanagan

## People we support

### ASSOCIATESHIP (2002)

University of Alberta

**Andrei V. Brantov** *Physics, Faculty of Science*, Plasma transport and kinetic theory

**Rui Chen** *Chemistry, Faculty of Science*, Development of two-dimensional liquid chromatography/mass spectrometry for proteome analysis

**Dalton J.E. Harvie** *Chemical & Materials Engineering, Faculty of Engineering*, A multi-fluid description of solid liquid suspension flows

**Omid Madani** *Computing Science, Faculty of Science*, Machine learning for control policies in image interpretation

**Lucero Mariani** *Renewable Resources, Faculty of Agriculture, Forestry & Home Economics*, Effects of soil fauna on organic matter mineralisation in boreal forest soils

**David Selby** *Earth & Atmospheric Sciences, Faculty of Science*, A new tool for geological age determination of hydrocarbons: development of the rhenium-osmium radioisotope system

**Yan Xin** *Electrical & Computer Engineering, Faculty of Engineering*, Peak-to-average power ratio reduction for multi-carrier modulation using guided scrambling coding

University of Calgary

**Jo-Anne C. Brown** *Physics & Astronomy, Faculty of Science*, Exploring the magnetic field in the disk of the galaxy

**David T. Corr** *Faculty of Kinesiology*, Molecular motors and mechanisms of contraction

**Sang-Un Park** *Biological Sciences, Faculty of Science*, Genetic engineering of opium poppy to improve growth and alkaloid yield

**Mikko T. Syrjasuo** *Physics & Astronomy, Faculty of Science*, Automated image analysis in auroral research

**Yingjun Zhao** *Chemistry, Faculty of Science*, Self-assembly of porous coordination solids for heavy metal sorption

University of Lethbridge

**Susan H. Lingle** *Psychology & Neuroscience, Faculty of Arts & Science*, Evolution of cooperation in deer

Olds College Centre for Innovation

**Daise Lopes** *Olds College Centre for Innovation*, Value-added natural products from Alberta's crops: identification and quantification of bioactive components

Virtual Materials Group, Inc.

**Andrew Liu** Calculation of physical properties with uncertainty integrated with process simulation

### CENTRES

**Alberta Ingenuity Centre for Carbohydrate Science**  
University of Alberta

**Alberta Ingenuity Centre for Machine Learning**  
University of Alberta

**Alberta Ingenuity Centre for Water Research**  
University of Alberta, University of Calgary, University of Lethbridge

### ESTABLISHMENT GRANT (2001)

University of Alberta

**Norman Beaulieu** *Electrical & Computer Engineering, Faculty of Engineering*, Innovations in theory and technology for wireless

**Subir Bhattacharjee** *Mechanical Engineering, Faculty of Engineering*, Development of a laboratory for colloidal phenomena and complex fluids

**Daniel Y. Kwok** *Mechanical Engineering, Faculty of Engineering*, Adsorption-mediated self-propelled drop movement on self-assembled monolayers

**Martyn J. Unsworth** *Physics, Faculty of Science*, Electromagnetic studies of tectonic processes

**Anthony K.C. Yeung** *Chemical & Materials Engineering, Faculty of Engineering*, Micro-interfacial phenomena

University of Calgary

**Jocelyn L.H. Grozic** *Civil Engineering, Faculty of Engineering*, A laboratory study on the geomechanics of gas hydrate formation/dissociation in porous media

**David C. Schriemer** *Biochemistry & Molecular Biology, Faculty of Medicine*, The development of advanced biomolecular interaction analysis tools for the post-genomic era

**Caterina Valeo** *Geomatics Engineering, Faculty of Engineering*, Emulating fire related disturbance in forested watersheds

**Hugh C. Williams** *Mathematical & Statistical Sciences, Faculty of Science*, Development and testing of number theoretic cryptosystems

University of Lethbridge

**Igor Kovalchuk** *Biological Sciences, Faculty of Arts & Science*, Pathogen-induced plant genome instability: a contribution to the evolution of resistance genes in plants

### FELLOWSHIP

University of Alberta

**Carolyn A. Bergstrom** *Biological Sciences, Faculty of Science*, Ecological and abiotic determinants of body shape variation in starry flounder

**Isabelle B. Charrier** *Psychology, Faculty of Science*, The perception of note categories in black-capped chickadees (*Poecile atricapilla*)

**Mee-Kyung Chung** *Chemistry, Faculty of Science*, Novel coordination catalysts for olefin polymerization

**Andrew N. Iwaniuk** *Psychology, Faculty of Science*, Neural basis of vocal perception in chickadees

**Bartosz R. Mielczarek** *Electrical & Computer Engineering, Faculty of Engineering*, Adaptive transmission techniques for future wireless high throughput packet data systems employing MIMO antenna systems and multi-carrier modulation

**Ray G. Poulin** *Biological Sciences, Faculty of Science*, Impacts of weather and climate change on potentially weather sensitive species: burrowing owls

**Maciej A. Slusarczyk** *Physics, Faculty of Science*, Quantum field theory and parallel computer algebra

**Xiaobin Zhu** *Physics, Faculty of Science*, Ultrafast scanning tunneling microscopy and nonequilibrium dynamics in magnetic nanostructures

University of Calgary

**Francois Anton** *Computer Science, Faculty of Science*, New paradigms for the interactive algebraic specification of the scalar field defining subdividable implicit surfaces and volumes

**Michal Bachar** *Chemistry, Faculty of Science*, The interaction of Aβ with cell membranes

**Margaret D. Campbell-Brown** *Geology & Geophysics, Faculty of Science*, Meteoroid orbital dynamics and physical characterization explored in the meteorite observation and recovery project (MORP) data

**Georgia Fotopoulos** *Geomatics Engineering, Faculty of Engineering*, Monitoring sea level changes in coastal region using GPS and other space-based and terrestrial techniques

**Zhiyong Fu** *Chemistry, Faculty of Science*, Imidophosphates: New building blocks for open-framework materials

**Alicia Garcia Herrero** *Biological Sciences, Faculty of Science*, Surface signalling through the ferric citrate uptake system in *Eschericia coli*

**Ioan Ghesner** *Chemistry, Faculty of Science*, Synthesis, properties and reactivity of dianionic 2,2'-diboratabiphenyls; development of transition metal - 2.2'-diboratabiphenyl complexes as effectice catalysts

**Jason Ho** *Biological Sciences, Faculty of Science*, Structural and biochemical characterization of the carbohydrate-binding properties of large Clostridial tozins

**Ghaus M. Rizvi** *Chemical & Petroleum Engineering, Faculty of Engineering*, Production of implantable skeletal structures using fused deposition modeling

**Anne-Gaelle B.M-L Rolland-Lagan** *Computer Science, Faculty of Science*, Pattern formation interacting with growth: modeling a growing leaf its venation

**Tamara N. Romanuk** *Biological Sciences, Faculty of Science*, Effects of diversity, complexity, and interaction strength on the stability of populations embedded in food web networks

**Andrew G. Tomkins** *Geology & Geophysics, Faculty of Science*, Evolution of ore bodies modified by sulfide melting during metamorphism

University of Lethbridge

**Rui Zhu** *Chemistry & Biochemistry, Faculty of Arts & Science*, Model reduction in stochastic kinetics

### INDUSTRIAL ASSOCIATESHIP

Alberta Research Council

**Anthony S.O. Anyia**  
Plant growth promoting organisms for mitigation of drought effects on wheat production

**Brian R. Eaton**  
Development and validation of monitoring protocols for sampling aquatic biodiversity: refining the aquatic protocol for Alberta Biodiversity Monitoring Program

Norcada Inc.

**Miroslav Below**  
Development of high performance transmission Fresnel zone plates for focusing soft x-rays

**Michael J. Colgan**  
Development of micro-electro-mechanical switch for wireless communications applications

SemBioSys Genetics Inc.

**Amanda J. Bodero**  
High throughput expression systems using *Arabidopsis thaliana*

**Catherine S. Smith**  
High throughput expression systems using *Arabidopsis thaliana*

Scanimetrics Inc.

**Keith B. Brown**  
Wireless, non-contact semiconductor test apparatus proof of concept prototype

Iunctus Geomatics Corp.

**Ian M. Chapman**  
Analysis software package for an imaging Fourier transform spectrometer

Komex International Ltd.

**Katharine M. Cross**  
Compost amendment of oil field waste to remediate high concentrations of petroleum hydrocarbon F3 and F4 fractions

TRLabs

**John E. Doucette**  
Development, modeling and implementation of service provisioning protocols for dynamic optical networks

**Padam L. Kafle**  
Space-time coded MIMO systems for broadband wireless communications

**John A. Pinkney**  
Asymmetrical spread spectrum for ultra low power wireless personal area networks

Advanced Integrated Microsystems (Canada) Ltd.

**Abebaw B. Jemere**

Sample preparation chip for proteomics

**Guifeng Jiang**

Protein extraction for sample preparation

MRF Geosystems Corp.

**Mark A. Kachmar**

Web-based GIS editing system research project

Resin Systems Inc.

**Takashi Kuboki**

Durability of version-based glass fibre composites under extreme loading and environmental conditions

Micralyne Inc.

**Mary W.M. Seto**

Surface micromachined devices

AgriGenomics Inc.

**Ashok K. Shrawat**

The development of transgenic plants with enhanced Nitrogen use efficiency

ChemRoutes Corporation

**Duane Stones**

ChemKits for SAR/Diversity

Random Knowledge Inc.

**Wei Sun**

Traffic Analysis Core (TRAC) development

Taurus Reservoir Solutions Ltd.

**Jin Wang**

Formulation and development of second generation of modular coupling technology for geomechanical modeling

## STUDENTSHIP

University of Alberta

**C. Maria-Luiza Antonie** *Computing Science, Faculty of Science,*

Efficient automatic digital document categorization

**Chunlong Bai** *Electrical & Computer Engineering, Faculty of Engineering,*

Hybrid automatic repeat request (ARQ) coding schemes for adaptive high throughput wireless data links employing multiple-input multiple output (MIMO) antenna systems

**Laurie L. Bloomfield** *Psychology, Faculty of Science,*

Gargle call perception and categorization in chickadees

**Lindsey E. Carmichael** *Biological Sciences, Faculty of Science,*

Population genetics, migration patterns, and subspecies classification of Arctic canids

**Jinan Chai** *Mechanical Engineering, Faculty of Engineering,*

Surface energetic influences on spray cooling efficiency

**Kenneth J. Chau** *Electrical & Computer Engineering,*

*Faculty of Engineering,* Ultrafast and nonlinear optics in nanophotonic structures

**Yunfei Chen** *Electrical & Computer Engineering, Faculty of Engineering,*

Novel receiver designs for diversity reception of fading signals

**Cheryl-Lesley B. Chetkiewicz** *Biological Sciences, Faculty of Science,*

Integrating habitat management and corridor design for carnivore conservation in the Rocky Mountains

**Michael S. Chubey** *Earth & Atmospheric Sciences, Faculty of Science,*

Assessment of forest biodiversity using remote sensing: a multi-scale approach

**Michael Chung** *Computing Science, Faculty of Science,*

Heuristic search and planning in real-time strategy games

**Kimberley R. Colvin** *Biological Sciences, Faculty of Science,*

Post-genomics approach to identifying BldG targets

**Derek Cyr** *Civil & Environmental Engineering, Faculty of Engineering,*

Influence of geology, shovel type and climate on oil sands fragmentation from bench face to crusher

**Prodip Das** *Mechanical Engineering, Faculty of Engineering,*

Design and simulation of colloidal microdevice actuated by surface potential modulation in a straight cylindrical capillary

**Bryan Demko** *Chemistry, Faculty of Science,*

Multinuclear magnetic resonance investigations of chalcogen containing compounds

**Zhen Y. Deng** *Computing Science, Faculty of Science,*

Investigation of vision-based control for human-assistive robotics

**Alexandra Eaves** *Biological Sciences, Faculty of Science,*

Changing the shape of evolution: How does environmental stress affect body plan determination in chordate ancestors?

**Anastasia L. Elias** *Electrical & Computer Engineering, Faculty of Engineering,*

Fabrication of perforated film nanostructures

**Kirk W. Feindel** *Chemistry, Faculty of Science,*

Solid State NMR investigation of spin-lattice relaxation of heavy nuclei and indirect characterization of EFG

**Michelle A.M. Forgeron** *Chemistry, Faculty of Science,*

New directions and applications of solid-state NMR

**Andrei N. Gaponenko** *Physics, Faculty of Science,*

TRIUMF weak interaction symmetry test: Precision study of muon decay

**Ankush Garg** *Biological Sciences, Faculty of Science,*

Gaining further insight into the functional parameters of transvection using the *Drosophila Melanogaster* vestigial boundary enhancer as a model system

**Nathan Gerein** *Chemistry, Faculty of Science,*

Al/Ni/Cu/Ti phase diagram via ultra high vacuum thin film deposition techniques and combinatorial experimental methods

**Kent D. Gislason** *Biological Sciences, Faculty of Science,*

Investigation of the role of an RNA helicase in regulation of antibiotic production and morphological differentiation

**Jennifer A. Graydon** *Biological Sciences, Faculty of Science,*

Mechanisms of mercury deposition and re-emission in the boreal ecoregion

**Ruby Grewal** *Biological Sciences, Faculty of Science,*

The control of active cell death in the face of oxidative stress

**Fagang Gu** *Civil & Environmental Engineering, Faculty of Engineering,*

Simulation of CO<sub>2</sub> sequestration and enhanced coalbed methane recovery in horizontal wells by reservoir and geomechanical coupling

**Sasan Haghani** *Electrical & Computer Engineering, Faculty of Engineering,*

New cellular system models and designs incorporating outage conditions

**Preston C. Holloway** *Chemical & Materials Engineering,*

*Faculty of Engineering,* Applications of induced high temperature metamorphism to metallurgical systems

**Suzanne C. Hoppins** *Biological Sciences, Faculty of Science,*

Investigation of Tim8 structure and function in *Neurospora crassa*

**Bo Hu** *Electrical & Computer Engineering, Faculty of Engineering,*

Phasor Nakagami-m fading model

**Jeremiah Hu** *Electrical & Computer Engineering, Faculty of Engineering,*

A practical design approximation to a maximum likelihood phase estimator

**Scott E. Irvine** *Electrical & Computer Engineering, Faculty of Engineering,*

Laser field femtosecond electron pulse generation

**Ernest J. Jankowski** *Physics, Faculty of Science,*

Software for optimal jet finding and particle mass determination

**Hans Martin O. Jensen** *Electrical & Computer Engineering,*

*Faculty of Engineering,* Chiral optical devices for optical computing applications

**John C. Koob** *Electrical & Computer Engineering, Faculty of Engineering,*

A 3D silicon-on-insulator computational RAM

**Hugo Lachance** *Chemistry, Faculty of Science,*

A stereoselective boronic acid route to the Mukaiyama aldol reaction

**Eric G. Lamb** *Biological Sciences, Faculty of Science,*

Competitive interactions along a moisture gradient and among species in a rough fescue grassland community

**Jeffrey E. Lane** *Biological Sciences, Faculty of Science*

Factors influencing reproductive success in male North American red squirrels (*Tamiasciurus hudsonicus*)

**Isabella C.Y. Lau** *Biological Sciences, Faculty of Science,*

Regulation of F conjugation

**Leon H.Y. Lau** *Chemistry, Faculty of Science,*

Single cell analysis: using CE-LIF to perform temporal studies of glycosylation in HT29 cells

**Gilbert C.J. Lee** *Computing Science, Faculty of Science,*

Verification of graph algorithms

**Jia Li** *Computing Science, Faculty of Science,*

Web usage mining for e-learning

**Pavel Loskot** *Electrical & Computer Engineering, Faculty of Engineering,*

Performance analysis of S+N hybrid diversity combining schemes

**Jun Lu** *Biological Sciences, Faculty of Science,*

Characterization of TraM functions in F conjugation system

**Amy M. MacDonald** *Chemistry, Faculty of Science,*

The effect of high dielectric additives in electrophoretic separations

**Adele Mandryk** *Renewable Resources, Faculty of Agriculture,*

*Forestry & Home Economics,* The theory and application of bioregional conservation to river valley and ravine systems

**Kathryn Martell** *Renewable Resources, Faculty of Agriculture,*

*Forestry & Home Economics,* Measuring wetland disturbance in Alberta's boreal mixed wood ecosystems

**Andrew Martin** *Mechanical Engineering, Faculty of Engineering,*

The effects of water vapour/surfactant interactions on the evaporation kinetics of hydrofluoroalkane propellant droplets

**Gary Mo** *Mechanical Engineering, Faculty of Engineering,*

Self-Propulsion of microdroplets on surfaces by molecular self-assembly

**Gabriela Moise** *Computing Science, Faculty of Science,*

Knowledge discovery methods for mining patterns across heterogeneous biological and bio-medical data sets

**Shawn F. Morrison** *Biological Sciences, Faculty of Science,*

Co-existence of multiple herbivores in an alpine ecosystem

**Laleh Najafi Zadeh** *Electrical & Computer Engineering,*

*Faculty of Engineering,* Novel hardware architecture and implementation issues for space-time coded OFDM systems

**Kristopher J. Ooms** *Chemistry, Faculty of Science,*

Cross-polarization from optically polarized 129Xe to 29Si in inorganic channels and cavities

**Hans D. Osthoff** *Chemistry, Faculty of Science,*

A laser based gas sensor for environmental monitoring

**Guoxin Pang** *Mechanical Engineering, Faculty of Engineering,*

Dropwise condensation on self-assembled monolayers

**Elise A. Parker** *Renewable Resources, Faculty of Agriculture,*

*Forestry & Home Economics,* Effects of landscape, grazing and soil characteristics on persistence and invasion of smooth brome in Alberta aspen parkland

**Shawn C. Parries** *Biological Sciences, Faculty of Science,*

Just Say NO: The developmental roles of nitric oxide in the pond snail *helisoma trivolvis*

**Derek L. L. Postnikoff** *Mathematical & Statistical Sciences,*

*Faculty of Science,* Symmetry and quasicrystals

**Brent S. Prickett** *Civil & Environmental Engineering, Faculty of Engineering,*

Partially encased composite columns made of high performance materials

**Melanie C. Purves** *Earth & Atmospheric Sciences, Faculty of Science,*

Search for extinct 182Hf in the Earth's core:

Application of the new 182Hf-182W system to mantle plume related magmatism

**Amir M. Rabiei** *Electrical & Computer Engineering, Faculty of Engineering,*

Noncoherent synchronized maximum likelihood sequence detection

**Todd Redding** *Biological Sciences, Faculty of Science,*

The influence of soil physical properties and harvesting on nitrogen cycling and transfer between forests and wetlands on the Western Boreal Plain of Alberta

**Jeffery M. Saarela** *Biological Sciences, Faculty of Science,*

Taxonomy, molecular systematics and population genetics of sweet flag (*Acorus, Acoraceae*)

**Mohammad R. Shadnam** *Mechanical Engineering, Faculty of Engineering,*

Micro-patterning self-assembled monolayer surfaces using a laser beam

**Rumana Sharmin** *Chemical & Materials Engineering, Faculty of Engineering,*

Data-based fault detection and isolation systems for the process industry

**Aaron Slepkov** *Physics, Faculty of Science*, Ultrafast measurements of nonlinear optical processes in conjugated organic materials

**Selena Y. Smith** *Biological Sciences, Faculty of Science*, Whole plant biology of tertiary monocots from western Canada: Implications for the evolution of the alismatids and zingibers

**Clark P. Svrcek** *Civil & Environmental Engineering, Faculty of Engineering*, Membrane filtration – minimizing fouling of low-pressure membrane filters as applied to drinking water

**Peng Tan** *Electrical & Computer Engineering, Faculty of Engineering*, Interference cancellation in wireless Orthogonal Frequency Division Multiplexing (OFDM)

**Gabrielle J. Tompkins** *Biological Sciences, Faculty of Science*, Evolutionary origin of mesoderm: the origin and fate of interstitial cells in the Cnidaria

**Winifred C. Topic** *Chemistry, Faculty of Science*, High resolution study of helium atom containing Van Der Waals complexes

**Yuanning Wang** *Electrical & Computer Engineering, Faculty of Engineering*, Modeling of electricity markets

**Mathew J. Willans** *Chemistry, Faculty of Science*, Characterization of carbon-13 and nitrogen-15 chemical shielding tensors in diamagnetic and paramagnetic transition metal cyanide complexes using solid-state NMR and Ab Initio calculations

**Christopher Williamson** *Biological Sciences, Faculty of Science*, Invasion biology of exotic brook trout in Alberta

**Jun Yang** *Mechanical Engineering, Faculty of Engineering*, Time-dependent electrophoretic flow and streaming potential in intersection microchannels & micropumps

**Jessica M. Zgurski** *Biological Sciences, Faculty of Science*, A phylogenetic study of the vascular plants based on sequences of the RNA polymerase genes RPB1 and RPB2

**Jungfeng Zhang** *Mechanical Engineering, Faculty of Engineering*, Effects of solid-liquid interfacial tensions on microfluidics

**Xiaodi Zhang** *Electrical & Computer Engineering, Faculty of Engineering*, Constellation mapping and diversity schemes for wireless image/video communications

**Yu Zhang** *Mechanical Engineering, Faculty of Engineering*, Micron-size particle deposition in an upper bronchial airway model

**Ling Zhao** *Computing Science, Faculty of Science*, Heuristic search in games and its applications

## University of Calgary

**Brooke A. Berard** *Geology & Geophysics, Faculty of Science*, Velocity modeling and depth migration of ground penetrating radar data

**Cheryl A. Bodnar** *Chemical & Petroleum Engineering, Faculty of Engineering*, Expansion of hepatic oval stem cells in bioreactors

**Michael J.D. Bosdet** *Chemistry, Faculty of Science*, Novel materials based on boron nitrogen heterocycles

**Patrick Brunelle** *Chemistry, Faculty of Science*, Damage to neuron cell membranes by glycy radicals

**Korey D. Conroy** *Chemistry, Faculty of Science*, Novel Group III metal complexes supported by phosphinimine-based ligands

**Jason R. Cooper** *Physics & Astronomy, Faculty of Science*, Application of semiclassical dynamics and quantum statistics to the prediction of vibrational-rotational spectra

**Sean A. Dalrymple** *Chemistry, Faculty of Science*, Flexible hydrogen bonded networks via second sphere interactions

**James A. Doherty** *Electrical & Computer Engineering, Faculty of Engineering*, An implantable microstimulator for recreation of impaired gastrointestinal motility

**Chantall L. Fedorchuk** *Chemistry, Faculty of Science*, Investigations of novel ligand systems

**Kyla M. Flanagan** *Biological Sciences, Faculty of Science*, Ecological processes linking aquatic community structure and trace gas flux rates in boreal wetlands

**Abhinav Gupta** *Computer Science, Faculty of Science*, Development of a scalable, robust and efficient position aided routing protocol for ad hoc networks

**Nicolas H. Hamilton** *Mechanical & Manufacturing Engineering, Faculty of Engineering*, Functional adaptation of bone

**Tara B. Hiebert** *Physics & Astronomy, Faculty of Science*, High-time resolution observations of pulsating aurora

**J. Matthew Hopkins** *Chemistry, Faculty of Science*, Design, synthesis and applications of novel 3,3'-BINAP ligands

**Casey R.J. Hubert** *Biological Sciences, Faculty of Science*, Nitrate mediated microbial control of souring in oil reservoirs

**Sean V. Hum** *Electrical & Computer Engineering, Faculty of Engineering*, Adaptive antennas for radio-on-fibre systems

**Heather A. Jamniczky** *Biological Sciences, Faculty of Science*, A reappraisal of the systematic relationships of extinct and extant turtles, with special reference to cranial arterial canals and foramina

**Olivier Julien** *Geomatics Engineering, Faculty of Engineering*, Study of performance of the future GNSS signal structure using an adaptive software receiver

**Peter G. Keech** *Chemistry, Faculty of Science*, Electrochemistry of solid oxide fuel cell anodes

**Russell J. Kruger** *Computer Science, Faculty of Science*, Orientation issues in co-located tabletop collaboration

**Robert A. Laird** *Biological Sciences, Faculty of Science*, Community ecology of mutualism and species coexistence

**Cori L. Lausen** *Biological Sciences, Faculty of Science*, Population structures of western small-footed bats and the big brown bats in southern Alberta

**Jolene L. Lepp** *Faculty of Kinesiology*, Subcellular mechanics of skeletal muscle contraction

**Justin L. MacCallum** *Biological Sciences, Faculty of Science*, Understanding the lipid bilayer as a solvent through computer simulations

**Leslie J. May** *Chemistry, Faculty of Science*, Structurally flexible 3-D networks based on weak sulfonate ligands

**Greg E.O. McFeetors** *Electrical & Computer Engineering, Faculty of Engineering*, 30 GHz re-configurable antenna array and transceiver

**Rachel S. Mintz** *Chemical & Petroleum Engineering, Faculty of Engineering*, Dynamic modeling and simulation of furnaces

**Cen Y. Ong** *Electrical & Computer Engineering, Faculty of Engineering*, Tunable optical filter

**M. Jake Pushie** *Biological Sciences, Faculty of Science*, Spectroscopic and computational studies of metal ion-binding interactions with peptides and proteins

**Jennifer L. Reid** *Chemistry, Faculty of Science*, Design and Construction of highly porous sulfonate-based frameworks

**Todd A. Richert** *Geomatics Engineering, Faculty of Engineering*, Investigation of the availability, reliability, and accuracy of GALILEO and its integration with GPS and GLONASS

**Kimberley Samkoe** *Chemistry, Faculty of Science*, Investigations into an automated clinical treatment for age-related macular degeneration using two-photon excitation photodynamic therapy on the chorioallantoic membrane of a chicken embryo model

**Randall K. Scharien** *Geography, Faculty of Social Sciences*, On the relationship between wind speed, sea ice melt pond morphology, and melt pond surface roughness: Implications for Synthetic Aperture Radar (SAR) scattering

**Stacey Scott** *Computer Science, Faculty of Science*, Territoriality in computer-supported tabletop collaboration

**Eric D. Snively** *Biological Sciences, Faculty of Science*, Comparative feeding mechanics of carnivorous theropod dinosaurs

**Jody L. Swift** *Chemistry, Faculty of Science*, Two-photon fluorescence cross-correlation spectroscopy in the development of new high context live cell screening technology for receptor binding

**Danuta M. Sztukowski** *Chemical & Petroleum Engineering, Faculty of Engineering*, Water-in-oil emulsions stabilized by asphaltenes and solids

**Yukiko Toyoda** *Faculty of Kinesiology*, Function of foot orthotic shoe inserts

**Sarah E. Trend** *Geology & Geophysics, Faculty of Science*, Time-lapse seismic reservoir monitoring of CO<sub>2</sub> injection into coalbed methane strata: Ardley Coal, Alberta

**Edward Tse** *Computer Science, Faculty of Science*, The single display Groupware toolkit

**Bronwen M.M. Wheatley** *Chemistry, Faculty of Science*, Design, Synthesis and application of 3,3'-disubstituted MeO-BIPHEP derivatives

**Trevor C. Williams** *Electrical & Computer Engineering, Faculty of Engineering*, Microwave breast cancer detection using tissue sensing adaptive radar

**Joanna M. Wilson** *Biological Sciences, Faculty of Science*, Insectivorous bats as predators during outbreaks of forest pests

**Kjell Wooding** *Mathematics & Statistics, Faculty of Science*, Development of a high-speed numerical sieving device

**Chengqian Zhang** *Geography, Faculty of Social Sciences*, Analysis of forest stand structure and Leaf Area Index (LAI) using spatial characteristics of panchromatic remotely sensed imagery

## University of Lethbridge

**Christine Reinhart** *Psychology & Neuroscience, Faculty of Arts & Science*, The amygdala as the possible mediator of social reciprocity

**Brent Sorensen** *Chemistry & Biochemistry, Faculty of Arts & Science*, Cellular and biochemical aspects of adipocyte differentiation in bovine muscle tissue

## NEW FACULTY GRANT

## University of Alberta

**Michael K. Deyholos** *Biological Sciences, Faculty of Science*, The Phleom proteome: development and function

**Mohamed Gamal El-Din** *Civil & Environmental Engineering, Faculty of Engineering*, Advanced oxidation treatment of wastewater: treatment enhancement and reactor design

**Sally P. Leys** *Biological Sciences, Faculty of Science*, The evolution of tissues: the origin and fate of the primary germ layers in basal metazoans

**Christopher B. Sturdy** *Psychology, Faculty of Science*, Neuroethology of songbird acoustic communication: from the beak to the brain and back

**Yunjie Xu** *Chemistry, Faculty of Science*, Cavity ring down spectroscopic studies of chiral molecules and chiral discrimination

## University of Calgary

**Elena Braverman** *Mathematics & Statistics, Faculty of Science*, Models of structured population dynamics

**Henrik C. Hansen** *Chemistry, Faculty of Science*, Prospecting combinatorial chemistry: a platform and tool for novel chemical and biological discoveries

**Chris J.B Macnab** *Electrical & Computer Engineering, Faculty of Engineering*, Control of nonlinear, flexible robots (Advanced Robotic Manipulation Laboratory)

**Rachid Ouyed** *Physics & Astronomy, Faculty of Science*, High performance computing studies of relativistic plasmas

**Edward J. Vigmond** *Electrical & Computer Engineering, Faculty of Engineering*, A fluidic-mechano-electrical computer heart model based on single cell discretization

## SCHOLAR

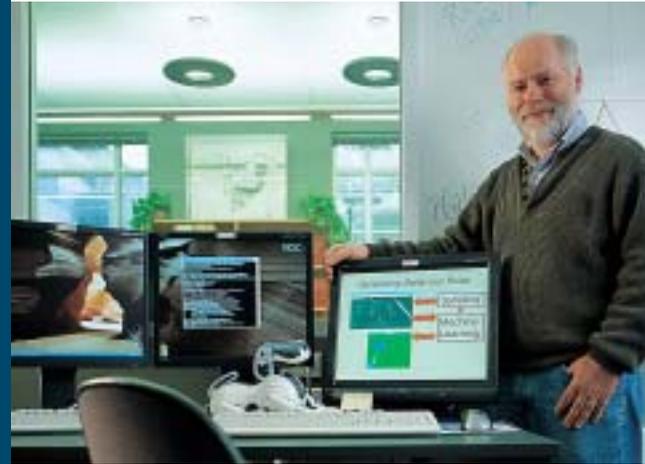
## University of Calgary

**Pedro R. Pereira Almao** *Chemical & Petroleum Engineering, Faculty of Engineering*, Innovation in catalytic processes for coupled bitumen upgrading/hydrogen generation

## **CENTRES**

The Alberta Ingenuity Centres program provides major grants to outstanding research groups at universities and colleges working in areas of strategic importance to Alberta. These Centres give Alberta universities and colleges a competitive edge for recruiting highly-qualified researchers.

## CENTRE FOR MACHINE LEARNING



Dr. Robert Holte

IT SEEMS TO BE GETTING HARDER AND HARDER TO glean knowledge from the mass of information that bombards us everyday. Databases with millions of records and thousands of fields are now common in science, engineering, medicine, and business. This mass of information has made analysis and the mining of information increasingly difficult. The field of machine learning provides the tools and technologies for finding significant patterns in data. These patterns can then be used to turn information into knowledge.

There are substantial benefits to be gained in virtually all sectors of the economy by applying machine learning to problems of process control, data analysis, and decision-making. For example, Dr. Russ Greiner, a principal investigator with the Alberta Ingenuity Centre for Machine Learning, is currently working on a collaborative project with the Cross Cancer Institute in Edmonton. Researchers at the Institute are interested in knowing whether DNA testing would help in identifying patients for whom certain therapies might be effective. Russ is using state-of-the-art machine learning techniques to investigate this possibility. The learning system he is developing will be fed the medical records and DNA test results for patients who have previously been treated and create rules that predict the effectiveness of a treatment.

DNA testing is expensive and for some patients it is not informative. Russ is also developing algorithms to determine which patients should be tested, given a limited budget.

“This project has been structured as a completely mathematical problem. It is exciting because it shows how fundamental research can be used to help solve real-world problems,” says Centre scientific director Dr. Robert Holte.

### 2003 – 2004 YEAR IN REVIEW HIGHLIGHTS

- Increased research personnel from four to seven principal investigators, including an iCORE Chair and a Canada Research Chair, and recruited the top new graduate in machine learning, robotics, and games.
- Won bid to host the 2004 International Conference on Machine Learning, and two other major international conferences in Banff, Alberta.
- Centre work presented to a wide range of scientific and industrial groups including the National Research Council of Canada, IBM, NASA, and Google.

Established 2002

### RESEARCH TEAM

University of Alberta

**Dr. Robert Holte** *Scientific Director*

**Dr. Randy Goebel** *Principal Investigator*

**Dr. Russ Greiner** *Principal Investigator*

**Dr. Jonathan Schaeffer** *Principal Investigator*

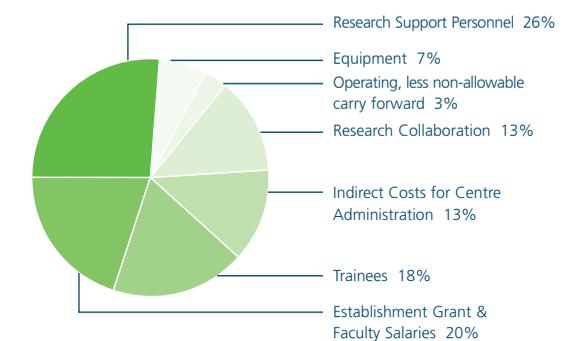
**Dr. Michael Bowling** *Principal Investigator*

**Dr. Dale Schuurmans** *Principal Investigator*

**Dr. Richard Sutton** *Principal Investigator*

### Budget Allocations

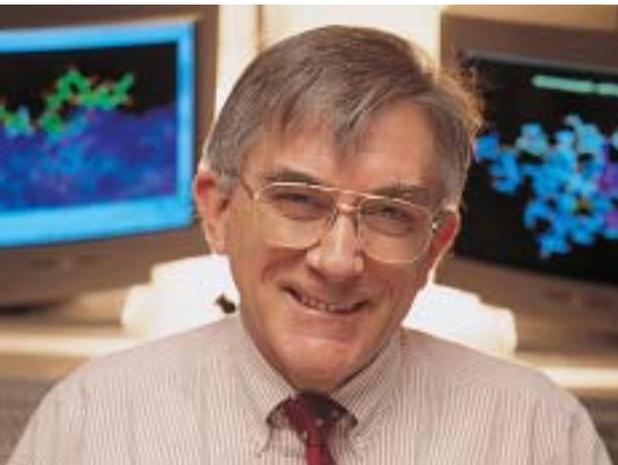
September 1, 2003 to August 31, 2004



Total Annual Budget approx. \$1.5 million

**OVER TIME,  
INGENUITY CENTRES  
WILL ALSO CONTRIBUTE  
TO ALBERTA'S ECONOMIC  
DIVERSIFICATION,  
GROWTH AND  
QUALITY OF LIFE  
FOR ALBERTANS.**

# CENTRE FOR CARBOHYDRATE SCIENCE



Dr. David Bundle

## 2003 – 2004 YEAR IN REVIEW HIGHLIGHTS

- Raised \$2 in other funding for every \$1 invested by Alberta Ingenuity Fund.
- Increased from 28 to 45 the number of research staff including research associates, trainees, and technicians.
- Attracted 10 international visiting leaders to Centre activities in Alberta.

Established 2002

### RESEARCH TEAM

University of Alberta

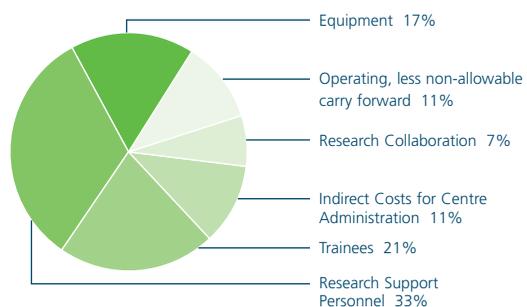
- Dr. David Bundle** *Scientific Director*
- Dr. John Klassen** *Principal Investigator*
- Dr. Todd Lowary** *Principal Investigator*
- Dr. Monica Palcic** *Principal Investigator*

University of Calgary

- Dr. Glen Armstrong** *Principal Investigator*
- Dr. Kenneth Ng** *Principal Investigator*
- Dr. David Schriemer** *Principal Investigator*

### Budget Allocations

September 1, 2003 to August 31, 2004



Total Annual Budget approx. \$1.3 million

## CARBOHYDRATES ARE ESSENTIAL TO LIFE.

Complex carbohydrates coat the surface of virtually every living cell. Carbohydrates also play a role in disease processes. Many bacteria are coated with carbohydrates, which are recognized by the antibodies of our immune system. Compared to DNA and proteins — the other basic building blocks of life — the chemistry of carbohydrates is particularly challenging. Complex carbohydrates have proven tricky to sequence and synthesize, and the details of their interactions with other cellular components are still not well understood.

Alberta is already widely recognized for its contributions to carbohydrate chemistry. The multidisciplinary team at the Alberta Ingenuity Centre for Carbohydrate Science builds on that excellence and extends the research to new areas of opportunity.

One of the research breakthroughs that the Centre is building on was made in Dr. David Bundle's lab and published in 2000 in *Nature*, the top scientific journal. His team developed a new carbohydrate molecule — dubbed "Starfish" because of its shape — that was tailor-made to neutralize the kinds of toxins that made diseases like hamburger disease and cholera so deadly. The five arms of "Starfish" attach very tightly to the toxins, making it impossible for the toxins to stick to healthy human cells.

The Centre will continue to develop further applications for "Starfish", extending beyond interactions with bacterial toxins to include brain amyloids, the target for the treatment of Alzheimer's disease. Other pioneering work includes the development of a small mass spectrometer for analysis of carbohydrates. Both of these technologies have attracted tangible interest from industrial partners.

# CENTRE FOR WATER RESEARCH



L to R: Ed McCauley, Daniel Smith, Stewart Rood

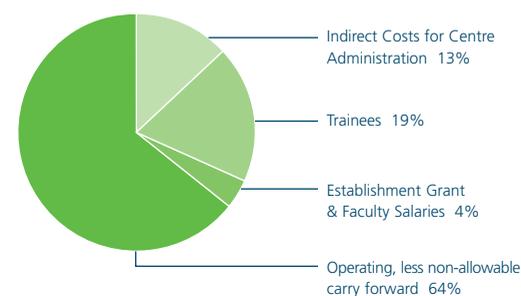
Established 2003

### RESEARCH TEAM

- Dr. Daniel Smith** *Scientific Co-Director*  
University of Alberta
- Dr. Ed McCauley** *Scientific Co-Director*  
University of Calgary
- Dr. Stewart Rood** *Scientific Co-Director*  
University of Lethbridge

### Budget Allocations

October 1, 2003 to September 30, 2004



Total Annual Budget approx. \$1.5 million

MANY OF US HAVE A NARROW FOCUS WHEN it comes to water — thinking of water only as something to sail on or something that comes out of a tap. But researchers at the new Alberta Ingenuity Centre for Water Research take a much broader view. They are looking at the big picture — water as an interconnected resource that is facing progressively greater challenges from human demands.

The Centre is a partnership among the Universities of Alberta, Calgary, and Lethbridge, with three co-directors representing each institution.

"The freshwater resources of Alberta are under pressure, just as they are around the world," says Centre Co-Director Dr. Daniel Smith. "Water is absolutely essential to our society. We need to understand the underlying processes that determine water quality and quantity. This fundamental knowledge will be critical to developing effective water management policies for Alberta, Canada, and the world."

"We also need a system to train and nurture scientists, engineers, and managers in water resources. Their expertise will lead Alberta forward with effective tools for managing our water resources. The new Centre is well-positioned to undertake both of these activities."

Specific research projects are in the early stages of development. They are organized under four themes: watersheds; water ecology; safety of water and wastewater; and economics, policy, and risk.

With a focus on Alberta, the Centre is an investment in both economic prosperity and environmental sustainability on a provincial level. It is expected to play a central role in the implementation of the research component of the Province's "Water for Life" initiative. Knowledge and solutions developed here in Alberta will be applicable to other jurisdictions. A strong network of world-class researchers, with close ties to national and international water initiatives, means that information will also flow back into Alberta.



Back row L to R: Peter Lacey, Mary Arnold, Scobey Hartley, Jim Edwards, Darrel Danyluk, Harvey Weingarten, Elizabeth Cannon  
Front row L to R: Terry Royer, Ron Triffo, Alvin Libin (Chair), Marv Moore, Grant Gillund

## ADMINISTRATIVE STAFF

**Dr. Bill Bridger**  
President and Chief Executive Officer

**Kathy Classen**  
Director of External Relations

**Nadine Cyr**  
Program Coordinator

**Dr. Wendy Lam**  
Director of Grants and Awards

**Rhonda Lothammer**  
Director of Communications

**Anne Thomas**  
Director of Operations

**Connie Thompson**  
Administrative Assistant

## BOARD MEMBERS

**Mr. Alvin Libin** Calgary  
*Chair*

**Ms. Mary Arnold** Edmonton

**Dr. Elizabeth Cannon** Calgary

**Mr. Darrel Danyluk** Calgary  
*Representative of the Association of Professional Engineers, Geologists and Geophysicists of Alberta*

**Mr. Jim Edwards** Edmonton  
*Representative of the University of Alberta*

**Mr. Grant Gillund** Smoky Lake  
*Representative of the Alberta Institute of Agrologists*

**Mr. Scobey Hartley** Calgary

**Mr. Peter Lacey** Red Deer  
*Representative of the Council of Board Chairs of the Public Colleges and Technical Institutes of Alberta*

**Mr. Marvin Moore** DeBolt

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**Mr. Ron Triffo** Edmonton

**Dr. Harvey Weingarten** Calgary  
*Representative of the University of Calgary*

## REVIEW COMMITTEE MEMBERS

**Catherine Lareshen**  
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**Kenneth Storey**  
Carleton University

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**David Burns**  
Conestoga College

**Gerry Tertzakian**  
Hannibal Ventures

**James Stewart**  
Natural Resources Canada

**Anita Arduini**  
NOVA Chemicals Corporation

**Kashmir Gill**  
NRC/IRAP

**Wolfgang Muhs**  
Techfund Capital Inc.

**Robert Hill**  
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**Franco Berruti**  
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**Hugh Jones**  
University Technologies International Inc.

**James Murray**  
Westlink Innovation Network Ltd.

**John Moldon**

## University of Alberta

Terry Caelli  
Dave Chan  
Gerda de Vries  
Steven Dew  
Laura Frost  
Murray Gray  
Dennis Hall  
David Hik  
Robert Holte  
Michael James  
Ron Kratochvil  
Suzanne Kresta  
Ellen MacDonald  
Horacio Marquez  
Curtis Strobeck  
Bruce Sutherland  
Janusz Zwiazek

## University of Calgary

Reda Alhadj  
Robert Brennan  
Eric Donovan  
O. Rod Fauvel  
Gary Margrave  
Martin Mintchev  
Warren Piers  
Anthony Russell  
Susan Skone  
Hans Vogel  
Richard Wan

## University of Lethbridge

Derek Peddle  
Marc Roussel  
Brent Selinger

## University of British Columbia

Michael Blades  
Peter Cripton

## SCIENCE AND ENGINEERING ADVISORY COUNCIL (SEAC)

**Dr. Khalid Aziz**  
Otto N. Miller Professor of Earth Sciences & Professor of Petroleum Engineering, Stanford University, California

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Endowed Professor of Analytical Chemistry, University of Washington; Affiliated Professor, Institute for Systems Biology, Seattle, Washington

**Dr. Michael W. Gray**  
Professor, Department of Biochemistry and Molecular Biology, Dalhousie University, Halifax, Nova Scotia

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Professor, School of Earth Sciences, The University of Leeds, U.K.

**Dr. Maria Klawe**  
Dean of Engineering and Applied Science, Princeton University

**Dr. Larry Milligan**  
Professor, Animal and Poultry Science, University of Guelph, Ontario

**Dr. Indira Samarasekera**  
Vice President Research, University of British Columbia

**Prof. George Sawatzky**  
Director, Advanced Materials and Process Engineering Laboratory (AMPEL), University of British Columbia

**Dr. John Schaefer**  
President, Research Corporation in Tucson, one of the oldest science granting agencies in North America; President Emeritus, University of Arizona

**Dr. Christopher Somerville**  
Professor of Biological Sciences, Stanford University

## We base our funding policies on two principles: fund only excellence, and support the best people so they can pursue their discoveries.

### Who are we?

Alberta Ingenuity Fund is the tradename of the Alberta Heritage Foundation for Science and Engineering Research, established by the Government of Alberta in 2000, with an Act of Legislature that provided an initial endowment of \$500 million. Interest from the endowment is used to support a balanced,

long-term program of science and engineering research based in Alberta. Alberta Ingenuity Fund operates at arm's-length from government, is governed by a Board of Trustees; headed by a President/CEO; and advised by an international science and engineering advisory council. Alberta Ingenuity is accountable to Albertans.

### What do we support?

Alberta Ingenuity Fund provides funding for various grants and awards programs in areas of basic and applied research.

We base our funding policies on two principles: fund only excellence, and support the best people so they can pursue their discoveries. Our programs are developed in consultation with our international Science and Engineering Advisory Council (SEAC), which is made up of scholars and experts recognized worldwide for their achievements, and the Alberta research community. They have stressed the need to maintain the competitiveness of Alberta's universities, public colleges and technical institutes, and industry when recruiting bright new researchers and encouraging scientific leaders to stay in Alberta. Our advisors have also stressed the importance of research training awards.

### How do we decide who and what to support?

Funding is approved by our Board of Trustees, which relies on the advice of our President/CEO and senior staff, and a wide network of advisors, beginning with our international Science and Engineering Advisory Council. All applications are evaluated using a rigorous peer-review system. Each application is assessed for quality by external experts and by review committees with representatives from Alberta and elsewhere. The review committees then forward their recommendations to our President.

### What programs do we offer?

Alberta Ingenuity supports a range of basic and applied research in diverse science and engineering disciplines:

**STUDENTSHIPS** Alberta Ingenuity gives top students full-time research training experience in a natural science or engineering discipline. Students currently in their first year of a graduate program and incoming graduate students are eligible.

**FELLOWSHIPS** Alberta Ingenuity helps post-secondary research institutions in Alberta expand their science and engineering research capacity by recruiting new and first-time postdoctoral researchers to Alberta.

**NEW FACULTY GRANTS** Alberta Ingenuity helps expand and strengthen Alberta's science and engineering research capacity by providing start-up support, primarily operating funds, to independent researchers who have their first academic appointment at an Alberta university, public college, or technical institute.

**INDUSTRIAL ASSOCIATESHIPS** Alberta Ingenuity helps early career researchers gain experience conducting cutting-edge applied research in an industrial setting. The program also helps start-up and technology-based Alberta companies gain additional research expertise at relatively low cost and low risk.

**SCHOLARS** Alberta Ingenuity provides resources to help universities and colleges recruit highly qualified researchers to build or strengthen outstanding research groups in areas of strategic importance to Alberta.

**INGENUITY CENTRES** Alberta Ingenuity offers major grants to outstanding research groups at universities and colleges working in areas of strategic importance to Alberta. These Centres give Alberta universities and colleges a competitive edge for recruiting more highly-qualified researchers.

### How does our endowment work?

Our endowment fund works like a trust fund that generates income from the principal. Interest from the endowment is used to support a balanced, long-term program of science and engineering research based in Alberta.

Our investment is managed by the Investment Management Division at Alberta Revenue. We work with them to ensure maximum performance of the endowment.

The endowment fund is currently valued at \$527 million (as of March 31, 2004).

### How are we accountable?

We report to the people and the Government of Alberta through the Minister of Innovation and Science. Our annual report is submitted to the Legislative Assembly of Alberta, and every three years, a more comprehensive triennial report is produced. In addition, an International Board of Review will assess our operations every six years.

We support bright minds working on a range of science and engineering research. We strive to attract great people to Alberta.

One of Alberta Ingenuity's main objectives is to encourage young Albertans to consider careers in science and engineering research. We partner with a number of community and academic organizations to sponsor science and engineering programs geared to youth.

### Supporting youth

Among the programs we support are:

**EARTH AND SKY** An internationally popular science program that airs province-wide on CKUA Radio.

**SUMMER CAMPS** These encourage young Albertans to discover the excitement of science and engineering including *Discover-E* (for Excitement) and *Minds-in Motion* summer science camps run by the Universities of Alberta and Calgary. Both programs also have rural outreach initiatives to provide children who live outside of the major centres the chance to participate in their camps. We are also pleased to sponsor *Destination Exploration* summer science camps in Lethbridge.

**WISEST** (Women in Scholarship, Engineering, Science and Technology) A summer research program at the University of Alberta. The program provides an opportunity for outstanding Grade 11 students from central and northern Alberta to experience hands-on research in campus laboratories for six weeks during the summer.

**INSIDE EDUCATION** A non-profit society that provides learning opportunities to facilitate an understanding of the interrelationship between science, issues, development and our environment.

**EXPLORE IT** An annual one-day workshop that encourages Grade 9 girls to explore careers in the IT industry.

**SCIENCE AND TECHNOLOGY WEEK** An educational initiative by Alberta Innovation and Science to highlight Alberta-based science and technology research and to encourage young people to pursue careers in these areas.

**ATA SCIENCE COUNCIL CONFERENCE** An annual conference for science teachers in Alberta.

### Annual Conference

Alberta Ingenuity hosts an annual conference on an issue of relevance to Albertans.

Our most recent conference *Watershed: Research Informing Public Policy*, featuring renowned scientific leaders and industry experts, explored the effect of climate change on our water supply, the impact of industry and agriculture on water systems, and effective monitoring of water supplies.

More than 170 people from industry, government, non-profit groups, the research community, education, and the general public attended the one day event in Calgary.

### In the Community

Alberta Ingenuity partners with a number of community organizations to support our objective of promoting science and engineering research in Alberta. Among the initiatives we support are:

**ASTech Awards**, which recognize and promote outstanding achievements in science and technology in Alberta.

**APEGGA Awards**, through sponsorship of the Alberta Ingenuity Research Excellence Award which is given annually to professionals in academia or industry who have conducted innovative research in engineering, geology, or geophysics.

**Innovation Alberta**, a weekly radio program on CKUA Radio that provides listeners with the latest information on cutting-edge research and innovation happening in Alberta.

## **FINANCIALS**

## People Supported in 2003–2004

<b>Students</b>	<b>128</b>
<b>Fellows</b>	<b>21</b>
<b>Associates</b>	<b>14</b>
<b>Industrial Associates</b>	<b>20</b>
<b>New Faculty Grants</b>	<b>10</b>
<b>Establishment Grants</b>	<b>10</b>
<b>Scholars</b>	<b>1</b>
<b>TOTAL</b>	<b>204</b>

For a free copy of our full audited financial statements contact us at:

Alberta Ingenuity Fund  
 710, 10104 – 103 Avenue  
 Edmonton, Alberta T5J 0H8  
 Tel 780.423.5735  
 info@a-ingenuity.ca

## Statement of Financial Position March 31, 2004

(thousands of dollars)

	<b>2004</b>	<b>2003</b>
<b>ASSETS</b>		
Current		
Cash	\$190	\$191
Accounts receivable	31	4
Prepaid expenses	15	5
	<b>236</b>	<b>200</b>
Long Term		
Property, plant and equipment	121	149
<b>Total Assets</b>	<b>357</b>	<b>349</b>
<b>LIABILITIES AND NET ASSETS</b>		
Current		
Accounts payable and accrued liabilities	1,388	655
Current portion of deferred lease inducement	10	10
	<b>1,398</b>	<b>665</b>
Long Term		
Deferred lease inducement	16	26
<b>Total Liabilities</b>	<b>1,414</b>	<b>691</b>
<b>Net Liabilities</b>	<b>(1,057)</b>	<b>(342)</b>
	<b>357</b>	<b>349</b>

## Statement of Operations For the year ended March 31, 2004

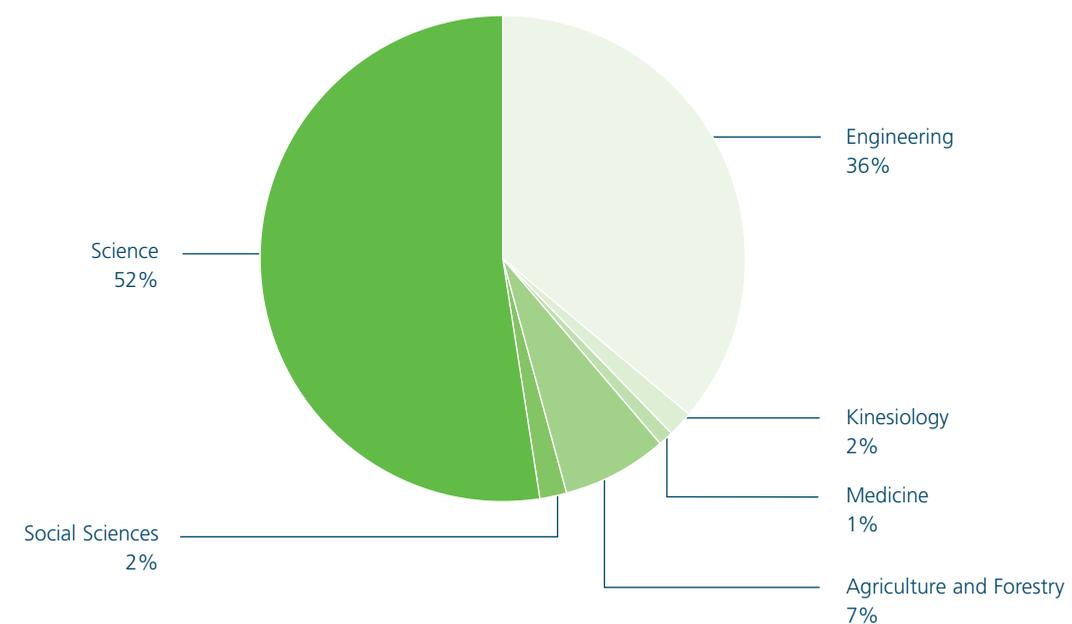
(thousands of dollars)

	2004	2003
<b>REVENUE</b>		
Transfers from Endowment Fund	\$10,416	\$6,325
Interest and other revenue	48	21
<b>Total Revenue</b>	<b>10,464</b>	<b>6,346</b>
<b>EXPENSES</b>		
Grants and Awards		
Students	1,735	1,024
Associateships	741	687
Fellowships	643	-
Industrial Associateships	646	-
Establishment	846	1,310
New Faculty Awards	162	-
Scholars	305	-
Ingenuity Centres	4,330	2,414
Special Initiatives	33	-
Inno-Centre	300	-
	<b>9,741</b>	<b>5,435</b>
<b>OPERATIONS</b>		
Peer Review	131	191
Human Resources	682	639
Communication and Education	206	127
External Relations	121	82
	<b>1,140</b>	<b>1,039</b>
<b>ADMINISTRATION</b>		
Corporate administration	133	147
Governance and planning	123	116
Amortization of property, plant and equipment	42	41
	<b>298</b>	<b>304</b>
<b>Total Expense</b>	<b>11,179</b>	<b>6,778</b>
<b>Deficiency of revenues over expenses</b>	<b>(715)</b>	<b>(432)</b>

## Grant Disbursement for 2003–2004

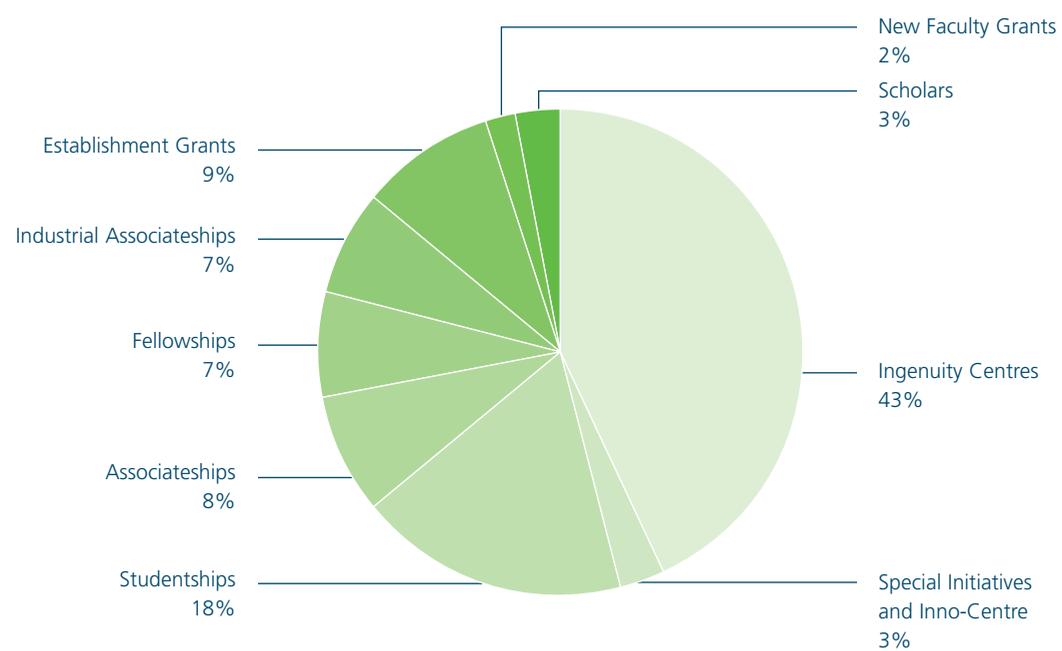
### By Faculty

Excluding our Ingenuity Centres



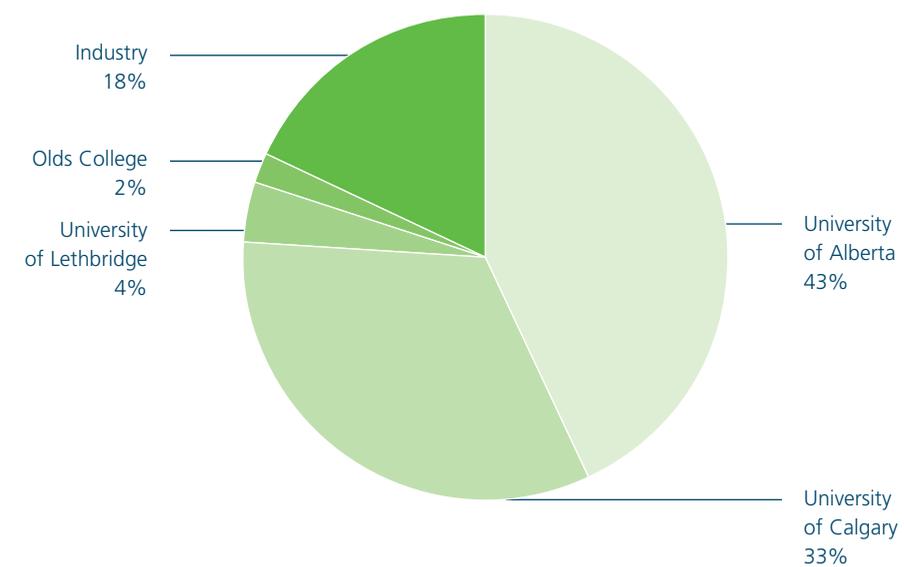
### By Grant Program

Including our Ingenuity Centres



### By Institution

Excluding our Ingenuity Centres



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A wide-angle photograph of a vast, golden wheat field stretching to the horizon under a clear blue sky with light, wispy clouds. The perspective is from a slightly elevated position, looking down at the field. The wheat is in full bloom, with a rich golden-brown hue. The horizon line is low, emphasizing the expanse of the field and sky.

**WE SUPPORT  
PEOPLE MAKING  
DISCOVERIES**