GLOBAL CHALLENGES
INNOVATIVE SOLUTIONS
The University of Alberta is located in Edmonton, the capital of Alberta and one of Canada’s most dynamic metropolitan cities.
THE UNIVERSITY OF ALBERTA

BECOMING ONE OF THE WORLD’S GREAT INTERNATIONAL UNIVERSITIES

The University of Alberta is located in one of Canada’s most dynamic metropolitan cities, Edmonton, the vibrant capital of the province of Alberta. This is a city of one million residents with one of Canada’s most diverse, robust, and rapidly expanding economies.

The university opened in 1908 as a board-governed public institution in a frontier town. That pioneering spirit inspires faculty and students to advance knowledge through research, to seek innovation in teaching and learning, and to find new ways of serving the people of Alberta and the world. The world is increasingly the U of A’s focus. And we are increasingly a magnet for talented students and researchers.

Today, U of A students and professors are looking beyond provincial and national borders, reflecting a global outlook, and forging links with countries around the world: More than 40 per cent of our professors are from outside Canada. Under the guidance of U of A International, we are transforming our institution into one that rivals some of the great international universities of the world. We already enrol more international graduate students than any other Canadian university.

The University of Alberta’s capacity to work effectively and productively across borders reflects our determination to forge partnerships and undertake initiatives for the global good. Our international expertise is tightly aligned with the university’s vision: to inspire the human spirit in a creative community, building one of the world’s great universities for the public good. Perhaps most important, the U of A’s leadership team has taken up the international directive by steering efforts to cultivate and form relationships abroad, knowing that top people in international institutions want to meet, know, and negotiate with the top people from our institution.

The U of A is also organized to engage, communicate, and exchange information on initiatives within the U of A community. Although many of our international initiatives have been formalized, some of the most productive and collaborative relationships U of A students and staff have forged with their colleagues around the world are developed individually. The University of Alberta community is reaching out across the globe every day, and the world is responding.

I invite you to learn more here about the University of Alberta and what makes us such a sought-after partner.

INDIRA V. SAMARASEKERA, PHD, OC

Henry Marshall Tory breaking ground for the U of A Arts Building in September 1909
PARTNERING TO TACKLE THE WORLD’S CHALLENGES

Alberta’s flagship university has helped Canada grow and thrive for more than a century. Today, the University of Alberta has extended its reach globally and is making a compelling case for collaboration on urgent issues the international community is embracing—issues such as energy and the environment, water, food security, and health.
The University of Alberta is diverse, rigorous, and defined by a pioneering spirit,” says President Indira Samarasekera. “Whether you are looking at the quality of our faculty, the achievements of our students, or the successes of our alumni, the impact of the University of Alberta is felt across Canada and around the globe.”

Indeed, today’s U of A is one of Canada’s premier research-intensive teaching universities, with 39,500 students—including nearly 7,600 graduate students—from across Canada and 152 other countries enrolled in 18 faculties on five campuses.

Beyond its size and diversity, and the wide-ranging educational interests of its student body, the U of A is home to international centres of excellence, world-leading programs, and a firm commitment to a curriculum that advances global citizenship.

Attracting some $460 million in external sponsored research funding last year, the university has used an open and fruitful dialogue with the three orders of Canadian government—municipal, provincial, and federal—to nearly double its annual research funding in the past decade, and ranks in the top three Canadian universities in annual sponsored research funding. An example of the U of A’s government relationships comes in the form of the Government of Canada research chair programs, which have been responsible for the U of A attracting and retaining more than 100 leading researchers. This support was critical to the U of A’s ability to attract four of the first 19 $10-million Canada Excellence Research Chairs—double any
other Canadian university—in virology, diabetes, oilsands molecular engineering, and Arctic resources.

That same support has also allowed the U of A to supplement its investment in people with an unparalleled investment in state-of-the-art facilities. The Centennial Centre for Interdisciplinary Science, which opened in 2011, is considered one of the most technically advanced science buildings in the world. Conceived to be at the crossroads for the world’s cross-pollination and incubation of ideas, CCIS is home to five research groups and more than 6,000 undergrads. Also new to the campus, the Edmonton Clinic Health Academy is poised to transform the way Canada and the world think about health care by embracing an interdisciplinary teaching and research model. More than 8,000 students and 2,000 faculty and staff from 43 health programs call ECHA home.

Strong ties at home have enabled the U of A to develop strong ties abroad—particularly with top-tier collaborators in Brazil, China, France, Germany, India, Mexico, and the United States—to develop research and teaching consortia involving academic institutions, industries, governments, foundations, and community organizations. In 2009, the U of A joined the Worldwide Universities Network (WUN), a group of 18 leading research universities established to facilitate international research and teaching collaborations. The U of A is heavily involved in fostering WUN’s primary global challenges surrounding climate change, understanding cultures, global higher education and research, and global public

18.2%

Percentage of international students in the 2012-13 year at the University of Alberta.
health and non-communicable diseases. In January of 2012, President Samarasekera was welcomed as chair of the WUN Partnership Board, which devises strategy for the network.

Perhaps most notably, international partners have looked to the U of A for leadership in the areas of energy and the environment. High on the list of initiatives related to energy and the environment is the 2009 agreement between the U of A and Germany’s Helmholtz Association. Called the Helmholtz-Alberta Initiative, with an initial $25-million investment from the Alberta government and additional funding from the federal government and the German government, this five-year partnership is driving technological innovation toward cleaner energy production.

This initiative has subsequently grown in scope to include collaborative research into health, particularly infectious disease and virology.

Interest in working with U of A health researchers stems from a long history of excellence in medical research. In 1921, U of A biochemistry professor James Bertram Collip played a key role in the discovery of insulin. In 1999, U of A researchers wowed the world with their successful islet cell transplantations on patients with Type 1 diabetes, a procedure known as the Edmonton Protocol. Today, researchers at the Alberta Diabetes Institute are co-ordinating a massive effort to tackle the vexing challenges posed by the growing epidemic of diabetes around the globe.

...it is the students of today who will ultimately solve the global problems of tomorrow...
The U of A leads the country in national 3M Teaching Fellowships, Canada’s highest award for university undergraduate teaching excellence.

The U of A has also been responsible for some of the most important breakthroughs in the field of virology—discoveries that have improved lives for millions. In the 1980s, virologist Lorne Tyrrell developed the first oral hepatitis B antiviral drug, called lamivudine, now used in more than 200 countries. Tyrrell now works with a team of international research stars at the renowned Li Ka Shing Institute of Virology, founded in 2010 through the generous support of the Li Ka Shing (Canada) Foundation, to treat and cure virus-related disease and reduce the global burden of viral disease.

Access to clean water is fast becoming one of the defining issues of the 21st century, and the U of A is set to become a leader in seeking solutions to the water challenge (see the next story).

Food production and the bio-economy are also strategic priorities for the U of A and the world. The university has strength in a range of disciplines that underpin social, cultural, scientific, and technological innovation in food and the bio-economy. World-class research facilities such as Agri-Food Discovery Place continue to link research capacity in food safety, agri-industrial technologies, and functional foods with provincial, national, and international industrial partners.

President Samarasekera says it is the students of today who will ultimately solve the global problems of tomorrow, so it is important that students are involved in all that the university does—in the classroom, in the lab, and in the field—with hands-on research and numerous global exchange programs.

“Change today happens on a global scale—and it happens quickly, sometimes in what genuinely seems like the blink of an eye,” says Samarasekera. “Each day brings a new sequence of challenges and opportunities: new ways to teach and learn, to discover, and to have an impact on the world. We want our students to have that hands-on experience to be able to adapt to an ever-changing environment.”
WATER: CRITICAL LEADERSHIP ON A CRUCIAL RESOURCE

The importance of water isn’t exactly breaking news—after all, clean drinking water ranks a close second to oxygen when it comes to life’s necessities. But as humanity’s demand for it continues to rise and global supplies become increasingly threatened, concerns related to water supply and use are shaping up to be among the critical issues of the 21st century.
The University of Alberta began formalizing its position as a world leader in seeking solutions for global water challenges in the spring of 2011, when university researchers, international partners, and public- and private-sector leaders came together to identify the university’s existing strengths in the field and to further develop interdisciplinary efforts in water-related research.

With a strong foundation in place, the committee envisioned the U of A Water Initiative.

“It’s not surprising that the U of A has such a strong presence in water research,” says Renée Elio, associate vice-president (research). “The most pressing challenges about water occur because society has to meet the water requirements for human health, for environmental sustainability, and for food and energy production.

“These are areas, along with natural resource policy and economics, in which we have great depth.”

Greg Goss, biological sciences professor and water initiative director, says Alberta is uniquely positioned to lead the global discussion of water. He sees the province as being at the nexus of all the world’s problems related to fresh water.

“We have declining supply from glacier melt and stream flows. We have changes in groundwater. We have resource extraction. We have climate change—which, among other things, is affecting water-flow patterns. And we have increasing urbanization,” says Goss.

“We want this initiative to mobilize all our resources into a cohesive recognized entity. We will engage our expertise in science, engineering, arts, and social science in new ways that will drive integrated economic, social, and industrial solutions to water challenges,” says Goss. “We want to integrate our efforts with leading institutions and agencies worldwide.”

To begin the process, researchers at the U of A will address water issues at home knowing this will lead to solutions abroad.

In August 2012, the U of A hosted the inaugural Integrated Watershed Innovation Forum, bringing together researchers and watershed management organizations from across the country to build consensus on best practice for integrated watershed management.

Part of the forum was to inform watershed management on different perspectives of integration. It is very much practitioner-oriented, with an overarching goal of advancing a research and practice dialogue on integration of ecosystems, social systems, and health systems,” says Lars Hallström, environmental policy researcher and event organizer.

The U of A is also taking a lead role in IC-IMPACTS, a five-year, $30-million partnership of three Canadian universities and 11 leading institutions in India. Focusing on clean drinking water, 100 U of A researchers in a range of disciplines will develop low-cost, reliable new technologies and infrastructure for monitoring, treating, and transporting water. Their efforts will benefit remote and rural communities in both Canada and India.

Sushanta Mitra, mechanical engineering professor and assistant vice-president (research), is the U of A lead on the collaboration. Mitra says the challenges are daunting, but whether the community is local or global, the focus is simple.

“Water is the life-sustaining necessity that links all of us.”

We will engage our expertise in science, engineering, arts, and social science in new ways that will drive integrated economic, social, and industrial solutions to water challenges.
The Fount of Knowledge: Talented Researchers

With more than 120 scholars spanning all 18 faculties, the University of Alberta is a hotbed of water-related research and activity. Here are just a few of the people engaging with partners around the world to identify the challenges and lead the search for solutions.

Brent Swallow’s research is an example of international collaboration on water issues at the U of A. Swallow, professor and chair of resource economics and environmental sociology, co-wrote a paper with colleagues from California and Kenya looking at household water supply in rural Kenya.

The team examined seven small communities in western Kenya, each with its own locally organized system for water supply. Two of them have protected streams and pipe their water directly into homes. Two have protected streams but no household connections, and the other three draw their water from potentially contaminated streams.

The team found, among other things, that piped water reduces the workload for women and girls, and makes it easier to grow gardens and raise livestock—both of which contribute to higher household incomes. The main stumbling block to collective water supply development seems to be resistance from men, because they would reap fewer direct benefits and would take on larger roles in water collection, traditionally a responsibility of women and girls.

For millions of people in many developing countries, groundwater with unacceptably high levels of arsenic is the only source of drinking water. Most currently available methods for removing arsenic from water are unaffordable and not completely effective.

Aman Ullah, an assistant professor of agricultural, food and nutritional science, believes the solution may lie in chicken feathers, a natural source of keratin, which is a biopolymer that can absorb metals. Unfortunately, the keratin is hydrophobic—water doesn’t enter into it—and must be modified to remove arsenic effectively.

Ullah is working to modify the keratin to be used directly in filters. The result could be a cost-effective technology that relies largely on a waste material (chicken feathers) and can be manufactured and distributed locally.

Debra Davidson, an associate professor of environmental sociology, studies the social dimensions related to natural resources and the environment.

In a world where resources—including water—are becoming scarcer, and where environmental issues like climate change may eventually alter the fabric of society itself, researchers like Davidson may help us find ways to cope.

Davidson has helped conduct climate change vulnerability assessments in Alberta and in Colombia, and is co-author of a book on the combined challenges of peak oil and climate change, Challenging Legitimacy at the Precipice of Energy Calamity. She is a lead author for the Intergovernmental Panel on Climate Change.

Xing-Fang Li’s research on the unintended consequences of disinfecting water shows the complexity of the issues. A professor of environmental toxicology, Li is developing new tools to discover byproducts of water disinfection that may be linked to a long-term risk of bladder cancer. Using samples of tap water, source water, and even swimming pools from across North America, Li is seeking ways to stop these toxic byproducts from forming in drinking water.
FOOD: GROWING IDEAS THAT FEED THE WORLD

If only the proverb, “Give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime,” were that simple. Although education is part of the solution, global food security goes far beyond food production and distribution to include issues of sustainability, governance, politics, poverty, land ownership, market systems, and climate change.
Whether on the farm or in the lab, the University of Alberta is a leader in tackling global food security issues. Strong collaborations with government, industry, foundations, and other post-secondary institutions have created research infrastructure at the U of A that is second to none, and supports the innovative work of talented scientists recruited from around the globe.

Nowhere is that ingenuity more at work than in the croplands of rural India. In June 2011, the Faculty of Agricultural, Life & Environmental Sciences and India’s MS Swaminathan Research Foundation partnered on an ambitious $4.9-million project to alleviate poverty and malnutrition in three Indian communities. That research has come to bear on once-diverse agricultural areas that have suffered nutritional deficiencies as local farmers have switched to cash-crop farming.

“Many of the people are now deficient in several nutrients because of the lack of diversity in what they eat,” says Nat Kav, a professor in the Department of Agricultural, Food and Nutritional Science and co-principal investigator of the project. He adds that iron deficiency and anemia are prevalent problems in the regions.

Cash crops such as rice and cassava have been valued over more traditional millet and yams, as well as many garden vegetables. But although it is profitable in the short run to grow the cash crops, it has had a detrimental effect on people’s health—illnesses related to iron deficiency are prevalent in the regions—and on the land.

“Cassava, over time, starts to degrade the soils,” says Brent Swallow,

Strong collaborations with government, industry, foundations, and other post-secondary institutions have created a research infrastructure at the U of A that is second to none.
Active in the emerging field of biotechnology, the U of A is at the forefront of groundbreaking research. The university’s successes are many, including doubling the capacity of rice crops in drought conditions, and creating fuels from discarded animal fat and crop seed oil. In Africa, U of A researchers are on hand to develop harder livestock and crops in villages that face food shortages.

Scholarly partnerships are being formed with institutions such as the Zhejiang Agriculture and Forestry University in China, to develop degree programs that focus on food security and safety. And to ensure continued engagement of young researchers in this complex field, the U of A partners with other countries such as Mexico, India, and Cuba in community service learning projects, allowing students to explore issues surrounding poverty, nutrition, and food production.

Famed U of A virologist Lorne Babiuk and his team are sharing a $3.1-million federal grant with scientists in South Africa to develop an inexpensive, heat-resistant vaccine that will protect cattle, sheep, and goats from five major infectious diseases. A second vaccine to combat the highly contagious African swine fever is also being developed. The project is supported by the Canadian International Food Security Research Fund, a $62-million, five-year initiative that teams researchers from developing countries with scientists from several Canadian universities, including the U of A, to find solutions to hunger and food insecurity in the developing world.

Communication professor Gordon Gow leads a team that is using existing technology infrastructure to engage with farmers in Sri Lanka and help them share information that could improve their quality of life. Gow says a lack of extension officers and limited access to resources such as the Internet make it challenging to mobilize knowledge in rural communities to help ensure food security and safety through sustainable farming practices.

"Sustainable agriculture and food security are global issues that affect Sri Lanka and Canada, and knowledge and knowledge mobilization are central to this objective of achieving food security and sustainability," he says. "Communities would have access and can use these technologies now and become part of a global knowledge common, contributing to that pool and drawing from it."

These practices will be used on farms, but not everyone in the community owns land. The team will look at integrating the non-landowners into the food production and processing chain, with a focus on empowering Indian women.

“The MS Swaminathan Research foundation and others have found that if we can engage women, then the chances of things like this flourishing are much higher,” Kav says.

a professor and co-principal investigator in the Department of Resource Economics and Environmental Sociology. “These farms have developed pest problems because they’ve been growing just one variety, making it easy for pests to attack them.”

To address this, the research team will introduce intercropping, the practice of planting multiple crops in the same area. Intercropping allows plants that require different nutrients to share farmland, introduces diversity, and ensures crops will be more resilient against pests.

The depth of expertise of my colleagues, especially in the Department of Agricultural, Food and Nutritional Science, all across the food chain, is incredible,” says Temelli.

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[bottom] Feral Temelli, a food process engineer, has devoted her quarter century of inquiry to researching value-added processing of crops. She looks specifically at ways of concentrating beta-glucan, a soluble fibre that has a demonstrated cholesterol-lowering effect to reduce the risk of heart disease and plays a role in regulating blood-glucose levels. "The depth of expertise of my colleagues, especially in the Department of Agricultural, Food and Nutritional Science, all across the food chain, is incredible,” says Temelli.

(right) The late Roy Berg, a world-renowned animal geneticist and a giant in Alberta agriculture, revolutionized the beef cattle industry in the 1960s with an innovative hybrid breeding program, which led to a 30 to 40 per cent increase in production.
HEALTH: RISING TO MEET GLOBAL HEALTH CHALLENGES

In an increasingly interconnected world, no country stands alone in preventing the next epidemic outbreak or fighting diseases like cancer, HIV/AIDS, or malaria.
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conFRonTing
Medical CrIsis

Faculty and students from the University of Alberta are rising to meet today’s global challenges through a variety of international and intercultural health initiatives, including one that takes aim at some of the world’s deadliest health crises.

Cancer is the leading cause of death worldwide, killing 7.8 million people a year. Malaria is the second most deadly communicable disease, killing up to 2.7 million people annually in 90 countries in South America, India, Southeast Asia, and Africa.

Innovative technology developed at the U of A has the potential to fight both diseases—in all parts of the globe. The portable “lab on a chip” genetic testing device uses nanotechnology that allows researchers to determine whether a patient is resistant to cancer drugs or has diseases like malaria. It can even pinpoint infectious diseases in cattle.

A partnership between the U of A’s School of Public Health and Makerere University in Uganda is raising awareness about HIV/AIDS in the African nation—and is cutting into the stigma that affects people’s willingness to seek treatment. Through community building and work on the ground, HIV/AIDS patients in Uganda are three times more likely to seek antiretroviral therapies than are patients in other sub-Saharan countries.

Each year, half a million women in developing countries die from complications in pregnancy and childbirth that are caused by social, political, and economic inequities. Research from the U of A is taking aim at those needless deaths in Pakistan by identifying women at risk and training care providers to ensure that expectant mothers’ health needs are met.

The U of A is home to Canada’s first stand-alone School of Public Health, which is accredited by the U.S. Council on Education for Public Health.

Virus-based diseases take a massive toll on human health and on health-care systems around the world. From dengue fever and HIV to influenza and hepatitis, virus-based infectious diseases afflict millions of people worldwide.

The University of Alberta is Canada’s leading university for research in virus-based diseases. There are more than two dozen researchers at the U of A whose teams explore aspects of virology from zoonotic diseases—those transferring between animals and humans—and host/virus interactions to poxviruses, RNA interference, viral diseases in post-transplant patients, viral replication, and hepatitis.

This concentration of excellence was recognized in 2010 with a gift of $25 million from the Li Ka Shing (Canada) Foundation and $52.5 million from the Government of Alberta to establish the Li Ka Shing Institute of Virology.

Among those researchers are Li Ka Shing Institute director Lorne Tyrrell, who developed the first oral treatment for patients with chronic hepatitis B, and Michael Houghton, who led the team that discovered the hepatitis C virus.

“We must seek great collaborators in order to achieve the results we want and to push our research forward,” says Tyrrell. “At the same time, we must remember that teaching and research need to be complementary to one another. Some of the ideas for our best research have come from teaching, and graduate students and postdoctoral fellows have their fingerprints on most of our significant discoveries.”

Houghton was recruited to the U of A from private enterprise in the United States as the Canada Excellence Research Chair in Virology. He is also the Li Ka Shing Professor of Virology. Recently, his lab made a major breakthrough, proving that a vaccine developed from one strain of the hepatitis C virus could stimulate antibodies against all known strains of the virus.

“This demonstrates that the Li Ka Shing Institute of Virology is internationally competitive in important areas of virology research,” says Tyrrell. “We are working on topics that are important to patients, and we want to translate discoveries from the lab to patient care. That has been our philosophy since day one. We have a long way to go, but this is a great step.”

Michael Houghton, Canada Excellence Research Chair in Virology and Li Ka Shing Professor of Virology, led the team that discovered the hepatitis C virus.

Renowned poxvirus researcher David Evans (far left) at work in the Li Ka Shing Institute of Virology

Michael Houghton, Canada Excellence Research Chair in Virology and Li Ka Shing Professor of Virology, led the team that discovered the hepatitis C virus.
More than 800 researchers at the University of Alberta are engaged in energy-related work, from improving extraction processes to reducing environmental impact.
ENERGY AND THE ENVIRONMENT: SHARING OUR EXPERTISE WITH THE WORLD

It is the signature global challenge of the 21st century: How do we effectively meet the energy needs of a changing world while successfully safeguarding the environment for future generations? The challenge is complicated by the need to ensure the integrity of thriving economies while allowing those that are lagging to grow, thereby maintaining or improving the personal well-being of workers and families.
The University of Alberta is at the geographical, technological, and ideological crossroads where energy needs meet environmental musts.

Here, the need to meet the world’s energy requirements is balanced against threats to the delicate and pristine natural resources of the North; the social and economic benefits of extracting oil are matched with the essential need to preserve indigenous customs and sacred places.

Due in large part to university-developed technologies allowing access to a rich base of hydrocarbon fuels in Alberta, Canada is now a major player on the global energy scene, helping to meet a growing demand. Alberta alone has 175 billion barrels of oil in oilsands reserves.

Energy research at the U of A follows a rich path of successes originally paved in the 1920s by Karl Clark. Known as the father of Alberta oilsands development, Clark devised the technique still in use today to separate oil from the sands.

This tradition of research excellence has grown from the U of A sitting at the helm of energy extraction research to include a leading role in examining environmental and social issues that are intertwined with resource production and use.

Today, more than 800 U of A researchers are engaged in energy-related work, almost all of it aimed at improving processes and reducing environmental impact.

In their quest for greater sustainability, the world’s energy producers have trained an eye on several U of A research projects, including the multimillion-dollar Geomechanical Reservoir Experimental Facility, which is designed to investigate carbon storage by giving researchers a better understanding of how carbon dioxide behaves underground.

Rick Chalaturnyk, director of the facility, explains that carbon containment is one aspect of an integrated, or systems-based, approach to reducing carbon emissions, which should also include alternative energy sources and the use of natural carbon sinks like forests.

“Carbon capture and storage is one of the few near-term technologies that allow us to directly reduce greenhouse gas emissions associated with fossil-fuel consumption,” says Chalaturnyk. “Others need to be incorporated, but each solution has its own costs and benefits.”

Weighing costs and benefits of different energy technologies was at the heart of a Chinese delegation’s visit to the U of A in early 2012.

Researchers from China and the U of A met to discuss research collaborations including carbon capture and storage, water and the environment, and energy policy and economics—issues of importance to both countries.

China is the world’s largest coal consumer and is looking for U of A expertise in clean coal technology to help address environmental issues. On the economics side of things, China is a potential market for bitumen from the oilsands and a likely research partner in oilsands engineering and science.

“We want to leverage the talent in these areas at both universities,” says Chad Liu, an energy researcher at the U of A. “This is really about two countries collaborating. We want to enhance our collaborations on clean energy, water, and energy policies.”
The University of Alberta is leading the search for energy solutions. More than 800 U of A researchers are engaged in oilsands-related work, almost all of it aimed at improving processes, reducing environmental impact, and boosting land reclamation and remediation.

Faculty members have pioneered many of the technologies used in the resource and environment industries today, from Jacob Masliyah’s strategic research in the area of bitumen recovery from oilsands—which led to significant changes in the operation of existing plant equipment and the design of new plants—to famed ecologist David Schindler’s exploration tying together the effects of the global phenomena of acid precipitation, climate warming, oilsands extraction, and stratospheric ozone depletion on freshwater ecosystems.

WRINGING SUSTAINABILITY OUT OF OILSANDS

Steve Kuznicki is widely regarded as the world’s leading authority on mixed co-ordination molecular sieves, which are membranes that filter molecules by size through the use of natural and synthetic crystal structures. In the oilsands industry, such sieves can be used to separate oxygen from carbon dioxide or mitigate the damaging effects of dihydrogen sulfide during processing.

Anne Naeth, a researcher in the Department of Renewable Resources, pioneered the use of a combination of seeds, roots, tubers, and clippings from which new plants grow—a mixture she refers to as “the litter of the forest”—to reclaim lands used in resource extraction.

A group of U of A researchers found that microbes could be used to increase the amount of water recovered from tailings ponds. When oilsands are processed, the leftover material is dumped into tailings ponds where it can take decades to settle. The group found that feeding organic waste to microorganisms that already exist in tailings ponds can accelerate the degradation of hydrocarbons, such as residual solvents and leftover bitumen, effectively speeding up the settling process.

Thomas Thundat, Canada Excellence Research Chair in Oil Sands Molecular Engineering, leads a research team that is casting a big net developing nano-scale sensors, which could be used in making oilsands extraction and refinement environmentally friendly and cost-effective, and which could have applications in biotechnology, environmental monitoring, and even detection of diseases. “It is hard to be creative when you have restrictions,” says Thundat. “Here at the University of Alberta I have found total freedom.”
The complexity of today’s problems requires unprecedented co-operation between researchers in the arts and those in the sciences. Whether the issue is water, energy, health, feeding the masses, or treating any number of maladies vexing humankind, the implementation of hard-science discoveries is only as effective as the depth and breadth of the groundwork laid by those in the social sciences and humanities.

Recognizing the crucial importance of this relationship between arts and science in solving problems, the University of Alberta unveiled its five-year academic plan in 2011 with the implicit intention of expanding linkages among all faculties as they address large societal issues.

“Our goal is to fully combine the intellectual power of our various faculties to be able to make a greater impact on the global challenges facing the world today,” says Lorne Babiuk, U of A vice-president (research). “With water, for instance, you can look at the politics surrounding it; you can also look at the socio-economic, cultural, legal, and educational aspects of water. It is my desire that faculties identify areas in which they want to build leading research initiatives, and the university is here to assist them in doing so.”

Taking up the charge is Petrocultures, a new research group at the U of A that came together to explore the under-examined socio-cultural impact at the crossroads of oil energy and culture. “There seemed to be an opportunity to build a genuinely new area of study that made a lot of sense to be at the University of Alberta—that we could attract attention to the U of A but also contribute to research culture in Canada and internationally,” says Imre Szeman, Canada Research Chair in Cultural Studies and group organizer.

Contributing to the scientific and policy-focused knowledge necessary for understanding and responding to climate change challenges, anthropology professor Mark Nuttall was awarded $1.8 million by the Commission for Scientific Research in Greenland.

Nuttall, one of the world’s most influential researchers on northern studies, was brought on to lead a major research program to improve understanding of the
Among the U of A’s 130 academic centres and institutes are the Prince Takamado Japan Centre for Teaching and Research, the Kule Institute for Advanced Study, and the Canadian Centre for Ethnomusicology.

interconnections between climate change, use of natural resources, non-renewable resource development, and social and ecological systems in Greenland.

Joining in the fight against the HIV/AIDS epidemic that has gripped south and east Asia, Jennifer Hsu, political science professor, released the book *HIV/AIDS in China: The Economic and Social Determinants*. More than three-quarters of a million people are now estimated to be living with HIV/AIDS in China, and it is now the country’s leading cause of death by infectious disease. Hsu, a researcher with the U of A’s renowned China Institute, analyzes the nature and impact of current economic and social changes and how these changes may be driving the epidemic.

According to Lesley Cormack, the U of A’s dean of arts, the university’s continued and long-standing global impact in the social sciences and humanities is part of an overarching want and need to help others.

“Arts help us to understand how and why we communicate in the ways that we do; how, why, and by what mechanisms some people have power and others do not; what issues matter in our political and social world; and how they come to matter,” says Cormack. “Arts are what help us to understand, express, and contest the social dynamics of the world around us.”

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**SUSTAINABILITY BY DESIGN**

The first step in tackling global challenges is solving the issues at home. The first step toward sustainability is settling on a definition of the word that everyone can agree on.

That has become part of the work of Gavin Renwick, an art and design researcher at the University of Alberta who has spent the bulk of his academic career as an “intermediary,” laying the foundation for dialogue between traditional Aboriginal knowledge and modern technology.

“Canadians largely see sustainability as a technological issue,” says Renwick, who has spent 15 years in Canada’s North. “The Aboriginal idea of sustainability is much more holistic. It has to do with community wellness, cultural continuity, and living with some degree of empathy with the ecosystem.”

Renwick is currently working with the Sambaa K’ee Dene First Nation. In the 1960s, they established the permanent Dene community of Trout Lake in Canada’s Northwest Territories in a conscious attempt to get back to the land. Now, Renwick is helping them design a new cultural facility that will “embody their identity and their relationship to the land, and facilitate the ongoing communication of traditional knowledge between elders and youth, between the community and other indigenous communities and the world at large.”

One of his first tasks was to arrive at a suitable Aboriginal definition of sustainability.

“Everything we do—from environmental design to architectural design, from teaching to developing the community’s economy—all fits into what they see as community wellness,” he says. “So how do we indigenize the Canadian way of thinking, especially around sustainability? How do we take two distinct but equally valid bodies of knowledge and create an equal dialogue to create something stronger?”

Renwick says the Sambaa K’e’s ability to live lightly on the land, and their willingness to adapt and incorporate new ideas and technologies, makes them almost precedent-setting in how to resolve this conflict between technology development and sustainability.

“Because of their relative isolation, and their cultural mentality and integrity, this is a great place to create a precedent, but it is also really important to reverse the knowledge flow. They have a lot to offer us.”

To help prop open these lines of communication, Renwick is in the midst of developing an institute for northern design and innovation, which he says will make the U of A a hub for the free flow of ideas from northern design researchers around the world. He is in discussion with people, institutions, and industry in Alaska, Denmark, Finland, Norway, Scotland, and across the Canadian North about this.

Renwick says the discipline of design has a lot to offer in the process of synthesizing competing interests, which he says is a critical step as development and exploration of the North begins to accelerate.

“How do we reinterpret design as a generalist discipline that can deal with the complexity of the modern world, of environmental issues, of identity within this country?” he says. “Design can be the mediator between all these ideas and disciplines.”

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Gavin Renwick, Canada Research Chair in Design Studies
A business education today has to be global. Students need to learn about different cultures and different ways of thinking in order to be successful.

Thanks to a string of visionary leaders and recruiting some key personnel to affect change, The Alberta School of Business at the University of Alberta has become a destination for students looking for an international education.

The school’s bachelor of commerce, MBA, and PhD programs have international enrolment of 17, 49, and 36 per cent respectively. Joseph Doucet, interim dean, says this reflects the school’s success in promoting its vision, Leaders from Alberta for the World, and in international recruitment, a characteristic of globally competitive business schools.

“With respect to classrooms and programs, international students enrich the learning environment by bringing their backgrounds, perspectives, and cultures to our campuses,” says Doucet. “The Alberta School of Business, as an example, is more attractive to all students because the diversity in the classroom better prepares our students for the world.”

Edy Wong, associate dean (international), echoes Doucet’s comments, stating that internationalization is almost a must, not only for universities but also for business schools.

“For business, a global education is particularly important because business now is global. The supply chain and the value chain are global. Nothing really happens in a single country outside the service sector,” says Wong. “If our students in business are not aware of this kind of relationship and how the supply chain is subject to different cultural and regulatory influences, they can’t be good global business leaders.”
Even when the solution to a global problem is straightforward, having the international business acumen to implement the solution is often the tricky part. Alberta School of Business researchers understand this.

Besides exporting dynamic business minds, the Alberta School of Business has packaged its curriculum and taken it abroad, offering a financial management master’s degree in China and executive programs in India, Nigeria, and Bolivia, to name a few. The school has been active in China since 1983.

The Centre for Entrepreneurship & Family Enterprise, founded by Lloyd Steier, professor of strategic management and organization, is the top centre of its kind in the world and has global appeal thanks to its dedication to understanding the particular conditions of family firms. As a leader in family enterprise curriculum development, the centre presents the internationally recognized Theories of Family Enterprise Conference each year and hosts a European study tour that exposes students to the important role family business and entrepreneurship play in different corporate governance systems throughout the world.

Randall Morck, professor of international finance and director of the Canadian Corporate Governance Institute, is an expert on China’s corporate governance. He has served as a consultant to the Canadian, U.S., and South Korean governments, the World Bank, the Toronto Stock Exchange, and the International Monetary Fund on corporate governance and other economic issues. He is a senior research associate at Harvard Law School as well.
NORTH CAMPUS

For more than a century, the University of Alberta’s original campus has been continuously reinvented architecturally in an effort to better educate its students and foster solutions to some of the world’s most pressing problems. Today, perched atop the picturesque North Saskatchewan River Valley, the university is the most modern of institutions, but maintains a link to the past.
“uplifting the whole people”

The University of Alberta is dedicated to the promise made in 1908 by Founding President Henry Marshall Tory that the University will act in the spirit that "knowledge shall not be the concern of scholars alone. The uplifting of the whole people shall be its final goal.”

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