how will we ensure our planet's survival?

how can different cultures live together in peace?

how can we improve the health of the world's population?

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|photo by Caz Zywatkauskas

MESSAGE FROM THE PRESIDENT

David Naylor
University of Toronto

As president of the University of Toronto, I am pleased to have this opportunity to share with you some of the excitement of Canada's leading university. Academic leaders everywhere are concerned with preparing the best, the brightest and the boldest to engage in major global issues. At Toronto, our students are learning to address the world's toughest questions in a dynamic environment, inspired by hundreds of top-flight scholars.

The University of Toronto warmly welcomes colleagues and students who want to learn Canada's best answers to the world's questions. We believe strongly in the international exchange of people and ideas, and look forward to establishing collaborative relationships that will support mutual learning and contribute effective solutions to meet global challenges.

This special supplement of DUZ showcases just a few of the major issues in which U of T scholars are involved — issues that we believe are areas of high priority around the world. Among the most pressing questions we all face are:

- How will we ensure the survival of our planet for future generations?
- How can different cultures live together in peace on the planet we all share?
- How do we improve the health and well-being of human populations around the world?

At the University of Toronto, bright students and leading scholars across the humanities, the sciences and the social sciences — are generating answers to these questions and posing new ones.

I am proud to share a small sample of U of T's leading health research in areas such as the genetic basis of neurodegenerative disease, and to introduce you to a handful of the many scholars who are working to address global warming and promote sustainable environments. You will also get a sense of how our humanists and social scientists are fostering cross-cultural understanding to help nations end long-standing conflicts, and meet people who are working to preserve languages and cultures and stand up for freedom of expression.

The University of Toronto is comprised of three distinct and beautiful campuses. Our largest and oldest, the St. George campus, is in the centre of the City of Toronto. Two newer campuses have emerged on parkland sites in the adjoining urban centres of Scarborough and Mississauga. These three distinct communities are part of one of the most linguistically diverse regions in North America, with more than 100 languages represented, a rich milieu of cultural opportunities and a vast network of healthcare institutions and enterprises of all types and scales.

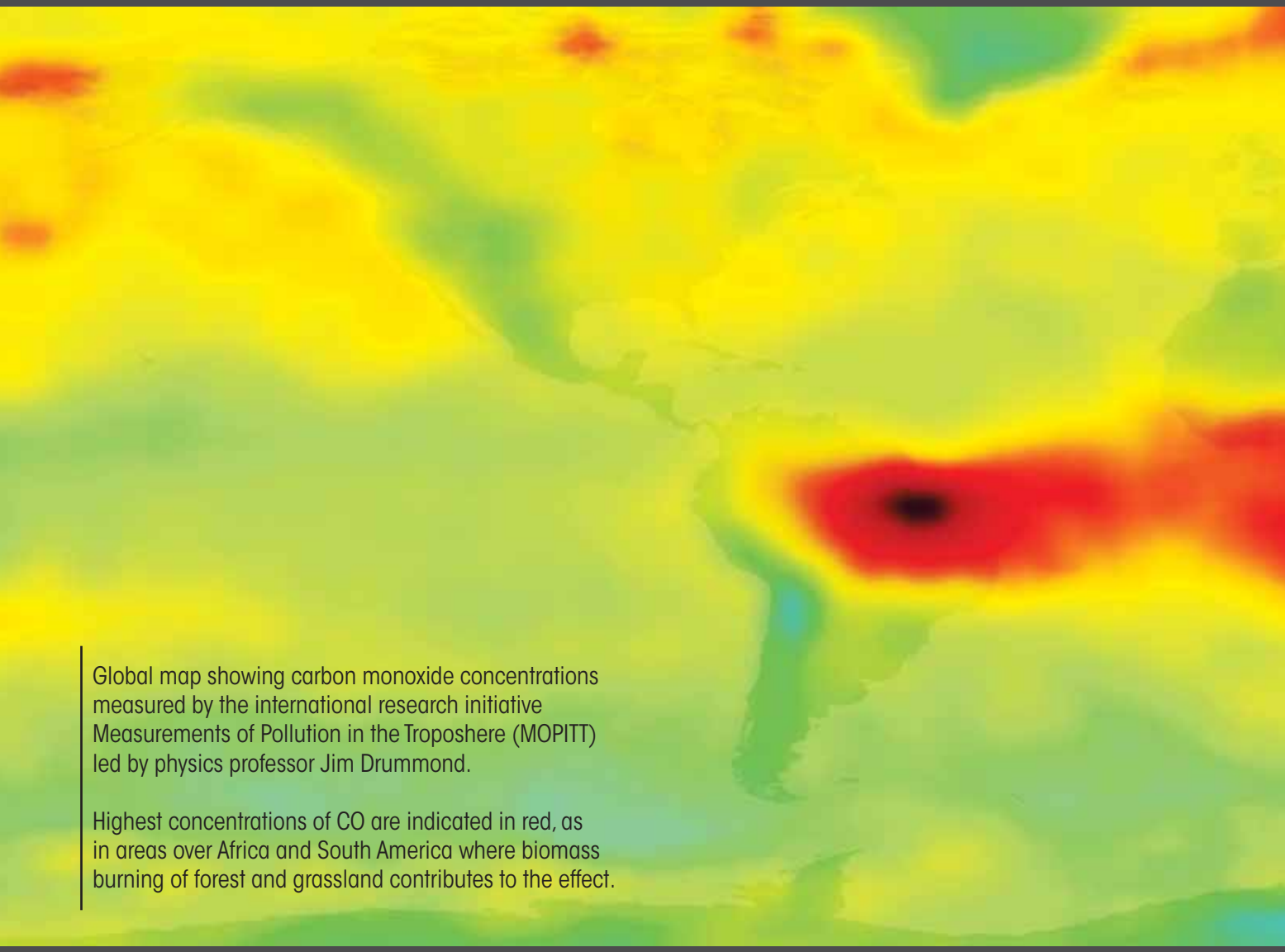
As one of our post-doctoral fellows recently said, "When you come to the University of Toronto you are not a foreigner". Wherever you come from, you will almost certainly find members of your community and reminders of your home.

I hope reading this issue piques your curiosity about how U of T students and faculty are making a world of difference. If you want to learn more about us, I encourage you to subscribe to any of the U of T publications on the back cover of this supplement or visit us at www.utoronto.ca. And of course, I invite you to contact the U of T's Berlin office at +49-30-2067-2712 or arrange to have a delegation visit through our international relations office at international.relations@utoronto.ca or +1-416-946-8828. We would be delighted to meet you.

Best wishes.

UNIVERSITY OF TORONTO

|Top cover image by Rita Leistner



Global map showing carbon monoxide concentrations measured by the international research initiative Measurements of Pollution in the Troposhere (MOPITT) led by physics professor Jim Drummond.

Highest concentrations of CO are indicated in red, as in areas over Africa and South America where biomass burning of forest and grassland contributes to the effect.

TRACKING THE DIRTY PRODUCTS OF A WORLD TRYING TO STAY CLEAN

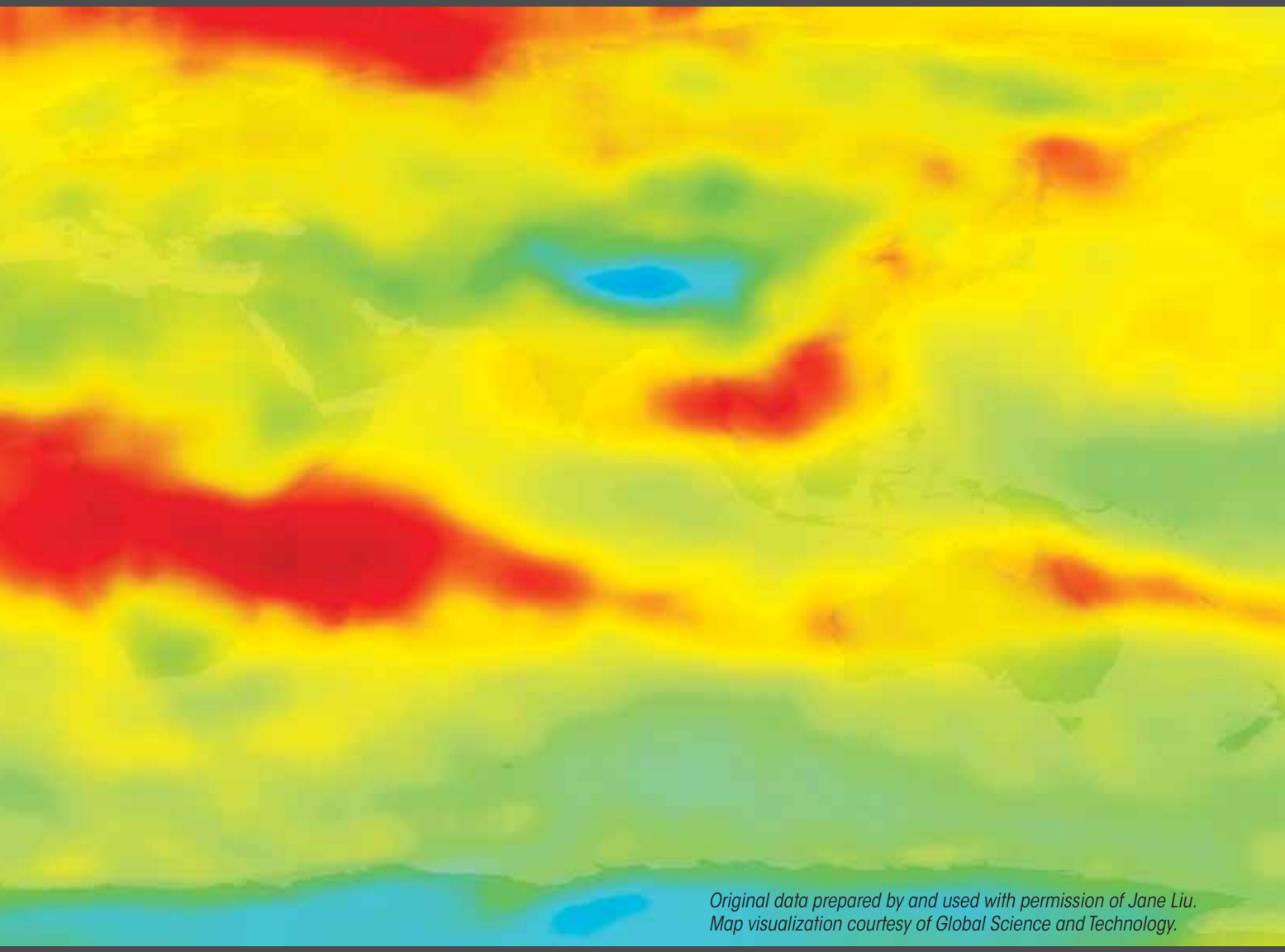
By Scott Mabury

Coating carpets, fabrics and paper products with fluorinated polymers and surfactants (e.g., ScotchGard and ScotchBan) gives them the water, stain and oil repellency properties that consumers so desire. In recent years, however, a pressing question has come to the fore for scientists and regulatory bodies like Environment Canada and the Environmental Protection Agency (EPA): Is there is a link between the world-wide occurrence of persistent, bio-accumulative perfluorinated acids—such as perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and related perfluorinated alkylcarboxylates (PFCAs)—with the use of these popular materials?

To find out, a working theory was constructed about the potential role of fluoroalcohols, the functioning component of the surface active materials, to serve as travel agents and precursors for the dissemination of these chemicals into the global environment.

Initial lab studies indicated that the chemical personality of the most prevalent fluorinated chemicals, the fluorotelomer alcohols (FTOHs), was characterized by high volatility, water repellency and some resistance to the atmosphere's naturally cleansing capacity. What this suggested was that the FTOHs would easily evaporate into air if allowed to escape from the consumer materials that contain the fluorinated polymers and surfactants; in fact, a campaign to sample air across North America found that the FTOHs were everywhere. Specialized lab studies, which mimicked the atmosphere, helped elucidate just how the FTOHs could be converted to the PFCAs, while field investigations buttressed the lab work by discovering and measuring PFCAs in rainwater.

The hypothesis of long-range transport and conversion of the FTOHs to PFCAs is supported by our discovery that polar bears and ringed seals in the Arctic are highly contaminated—with PFCA levels doubling every five to seven years since the early 1990s. Fluorinated pollutants, in fact, have now supplanted chlorinated pesticides and industrial pollutants as the dominant chemicals in polar bears. Further detection indicated that the chemical fingerprint of the PFCAs in polar bears points to the FTOHs as the likely source. Overall, the experiments and data available to date support a "precursor alcohol atmospheric reaction and transport" or PAART theory, which suggests that controlling the inadvertent release of



Original data prepared by and used with permission of Jane Liu. Map visualization courtesy of Global Science and Technology.

FTOHs from consumer materials could serve to reduce significantly the continued contamination of the Arctic.

It is still not possible to explain fully the presence of PFOA at relatively high concentrations in human blood. While the chemical fingerprint is consistent with the FTOHs as a source, it also suggests modest exposure to PFOA itself. Direct exposure to FTOHs, through inhalation or ingestion, would result in rapid metabolic conversion to PFOA via highly reactive intermediates that are of potentially toxic concern. The source of exposure could be the out-gassing of the FTOHs from carpets or fabrics, or even the ingestion of fluorinated surfactants used widely in the food packaging industry. Current experiments are focused on addressing these questions.

To solve the global fluorinated chemical contamination problem requires a lucid understanding of the chemistry controlling the movement and fate of these materials. In this way, appropriate recommendations can be made to regulatory and industrial decision makers with a view to implementing efforts designed to mitigate the problem and ultimately solve it. Recent regulatory action undertaken by Environment Canada and EPA point to a positive movement towards solutions that will allow the continued use of fluorinated surface active materials, without the attendant contamination of our environment with the dirty byproducts.

Scott Mabury, a professor of chemistry, leads an environmental chemistry group which is researching the degradation mechanisms in the natural environment by using chemical pollutants as scientific probes. (This article originally appeared in idea&s, the arts & science review, *Volume 3, Number 1.)*

research notes

The University of Toronto has more than 400 faculty across the university's three campuses who do environmental research and teaching in a wide variety of disciplines. Here is a small sample of their work.

Nanotech breakthrough boosts solar power

Ted Sargent, a professor in electrical and computer engineering and the Nortel Networks Canada Research Chair in Emerging Technologies, is renowned for his breakthroughs in nanotechnology. He recently developed the world's first plastic solar cell that harnesses the power of the infrared spectrum, a tremendous step forward in making environmentally friendly energy a cheap and clean alternative.

EARTH DOCTOR

Dick Peltier's Lab is the Planet Itself

By Paul Fraumeni

Dick Peltier doesn't like mystery when it comes to planet Earth. The renowned physicist has spent the past 34 years learning the complex science behind virtually every physical force that governs our planet — from ancient ice ages to how oceans work. He has developed powerful models, using sophisticated mathematical concepts, to depict what has happened to our climate over the past 600 million years — and, based on that information, what is likely to happen far into the future if we don't change our environmentally damaging ways. Those models are considered the gold standard for researchers trying to understand climate change.

His stunning achievements have been recognized with many of the top honours in his field — the 2004 Vetlesen Prize (among the most prestigious of international earth sciences awards), a Guggenheim Fellowship and the title University Professor — U of T's highest academic honour.

No wonder then that Peltier was one of the lead authors of the influential fourth report of the United Nations Intergovernmental Panel on Climate Change, released this past February to international acclaim.

"My work is not about policy or social science or to recommend 'what should we do about it?' I leave that to specialists in those areas. My focus is the science of what's going on."

What is going on when it comes to climate change? Peltier's research on this front is well known — that humans are causing the climate to change primarily through greenhouse gas concentrations produced by automobiles and industry. But there is more to learn.

> "the real key to **understanding** the science of our planet and its atmosphere is a **multidisciplinary approach**"

Peltier is quick to point out climate change scientists still face a number of "big unknowns. For example, there is a lot to learn about how clouds work in the environment and to what extent are they reflective of radiation from the sun." And he wants to develop models that can more accurately predict what will happen to the ice sheets in Greenland and the Antarctic as the planet's climate heats up.

True to form, Peltier is developing initiatives that will help to solve the remaining unknowns. One of them is his leadership in bringing new and very powerful high performance computing technology to U of T and the hospitals affiliated with the university. Peltier and colleagues in Toronto have formed a consortium called SciNet. The computing technology that will be acquired through the SciNet initiative (with support from the Canada Foundation for Innovation and the Province of Ontario) will allow for the speedy manipulation and storage of extremely large datasets, facilitating research in climate change (and a host of other fields) that would otherwise be impossible. "This equipment will enable us to simulate 250 years of climate history. To do that, it comes down to raw computer power."

To delve even deeper into the mysteries of earth science, Peltier launched the Centre for Global Change Science in 2006. Through a variety of programs — a distinguished lecturer series and hands-on research opportunities for graduate and undergraduate students — the centre is developing the next generation of earth science experts. But Peltier notes the real key to understanding the science of our planet and its atmosphere is a multidisciplinary approach. "In climate change research, you have to look into everything — the clouds, the oceans, the atmosphere, the interior of the earth, solar energy. You simply can't work in a silo. Physicists, chemists and biologists all can and need to contribute. That's how we have come this far in our understanding of what is happening in climate change and that's how we will take the next crucial steps."

Paul Fraumeni is director of research communications at the University of Toronto. (This article originally appeared in Edge, *U of T's research magazine, Summer 2007.)*

| photo by Liam Sharp

research notes

Window grime contributes to smog

A U of T research team led by James Donaldson in Chemistry and Physical and Environmental Sciences at University of Toronto Scarborough found that the grime that accumulates on windows, buildings, roads and other surfaces in urban areas could be an important source of nitrogen oxide air pollutants that combine with other air pollutants to form smog. The group discovered that window grime contains nitrogen compounds that disappear at rates which can't be explained by rain washout. Their evidence suggests that window and other surfaces may be where inactive nitrogen oxides are transformed into active forms and released into the atmosphere, a process that may be triggered by sunlight shining on film-covered surfaces.

Beware Kudzu

Rowan Sage of Ecology and Evolutionary Biology is looking at climate controls and the potential proliferation of the native Asian tropical plant kudzu, which has killed trees and other plants by overtopping and shading them and is heading north to Canada. It may be that warming winter temperatures are responsible for kudzu's recent invasions into the Midwestern United States and if warming trends continue, kudzu should be able to survive as far north as Canada in as little as 10 to 15 years. Sage's research may help protect Canadian farms and forests.

Diox biofuel clean and energy-rich

Chemical engineer David Boocock developed a clean-burning fuel from waste animal fat that is twice as energy-rich as conventional biodiesel. An added bonus: when burned, it releases significantly less pollution than petroleum-based fuels. Today Biox Corp, the spin-off company bringing the discovery to the market, produces nearly 70 million liters per year.

Stopping the spread of ragweed

Peter Kotanen, a botanist at University of Toronto Mississauga, is conducting studies at Jokers Hill to stop the spread of ragweed, a native Canadian plant which has reversed the usual pattern by invading Europe. Kotanen is the North American point person in an international collaborative project to trace the pedigree and ecological and evolutionary consequences of its Transatlantic crossing.

To find out more about U of T scholars and scientists working on environmental issues, visit the research database at www.environment.utoronto.ca.

Telling the public what we know is how scientists, humanists and social scientists make an impact through research. Our product is years and years of study about problems that are important to the world. That's what the community invests in and rightly so – so that when there is a crisis and important decisions have to be made there are Canadians who can contribute.

— Janice Stein is the Belzberg Professor of Conflict Management and Negotiation and founding director of U of T's Munk Centre for International Studies. A Middle East specialist of the first rank and a pioneer in the study of negotiation theory, foreign policy, decision-making, international conflict and conflict management, she has advised governments around the world.

WE ARE TALKING TO OUR YOUNG

AND HOPING THEY WILL UNDERSTAND

By Keren Rice

According to the 2001 Canadian census, 17,352,315 Canadians—of a total population of 29,639,035—declare English to be their mother tongue, while 6,703,325 report their mother tongue as French. Of the non-official languages, only two Aboriginal languages make it onto this list: Cree, with 72,885 speakers, and Inuktitut, with 29,010. Other Aboriginal languages, among them Ojibwa, Montagnais-Naskapi and Chipewyan, are mentioned in a table dealing with population reporting an Aboriginal identity by mother tongue. Then there are those that do not appear in either census table, such as Oneida, Mohawk and Haisla. Putting all of the 60 Aboriginal languages together, the population reporting an Aboriginal identity by mother tongue numbers 186,835—far fewer than the mother-tongue speakers of Cantonese (322,315), Italian (469,485) or even Arabic (199,940). Not only are there fewer speakers of the Aboriginal languages, which, unlike English and French, tend to be spoken only in isolated communities, but over the years, their numbers have diminished.

These small numbers, and the bilingualism of the Aboriginal peoples of Canada, suggest to some that the loss of the Aboriginal languages is inevitable and a consequence of history taking its natural course: languages have been lost in the past; languages will be lost in the future; shifts in language occur. Why are the Aboriginal languages of Canada any different from any other language which is no longer spoken? Why is there a sense of mourning when people realize the children are not speaking in the tongues of their forebears?

People grieve the loss of languages for many reasons. One is the privation of the unique contribution each language makes to understanding the human cognitive capacity. For example, verbal forms can express unique aspects of a culture and its values, as they do in Slavey. This Athapaskan language, which is spoken in parts of the Northwest Territories, the Yukon and British Columbia, has a verbal term for behaviour that is valued culturally and striven for (sédıt'é) and one that belongs to the ordinary everyday (sédıt'é íle); many verbs come in such word pairs. Another example is the different ways in which plurality can be conceptualized. Unlike English, and many other languages which designate plurality through a suffix on the noun, Slavey does so through a prefix on the verb that designates no inherent endpoint. Thus, when a language dies, linguistic diversity, intellectual wealth and windows onto the human mind are lost.

But is diminishment of diversity enough to compel efforts around the world to sustain and revitalize languages? When one considers what speakers of Aboriginal languages say about the threat to their languages, a distinctive perspective on the importance of language emerges. In their 1990 statement, *Toward Linguistic Justice for First Nations*, the Assembly of First Nations expressed the significance that language has for the Aboriginal peoples of Canada: "Language is our unique relationship to the Creator, our attitudes, beliefs, values and fundamental notions of what is truth. Our languages are the cornerstones of who we are as people. Without our languages our cultures cannot survive." In 1992, the Assembly elaborated: "Aboriginal language is an asset to one's own education, formal and informal. Aboriginal language contributes to greater pride in the history and culture of the community; greater involvement and interest of parents in the education of their children; and greater respect for Elders. Language is the principal means by which culture is accumulated, shared and transmitted from generation to generation. The key to identity and retention of culture is one's ancestral language."

Language, therefore, is about identity, culture and knowledge: it connects people with one another and the land, and provides a sense of history and selfhood. This deeply personal value of language reverberates in the statements of First Nations, in the writings of Aboriginal authors. Their words, set in a context of psychological trauma arising from forced language deprivation and the devaluation of epistemologies, cultures and spirituality, starkly highlight the profound role language plays in a people's identity: when a people forget a language, they forfeit the heart of who they are and the ability to comprehend the stories that are central to their cultural, spiritual and emotional health. This is why the loss of a language is so deeply mourned.

The pervasive sense of loss has spurred action. From community radio shows to the Aboriginal Peoples' Television Network, from language programs in local schools to language programs at universities, from speakers teaching out of their own desires to preserve languages to formal certification programs in Aboriginal language revitalization, from community publishing of dictionaries and stories to the federally-sponsored Aboriginal Languages Initiative Committee—communities at all levels have risen to the challenge faced by impending language extinction and set about the task of rebuilding, of reconnecting, of, as Coast Salish poet Frank Conibear puts it, "discovering a healing song".

Keren Rice, a professor of linguistics and director of the Centre for Aboriginal Initiatives, holds the Canada Research Chair in Linguistics and Aboriginal Studies. (This article is excerpted from a piece which originally appeared in idea&s, the arts and science review, *Volume 2, Number 2.)*

| *photo by Liam Sharp*

DAVID CAMERON EXTENDS HIS HUMANITARIAN ACTIVISM AND SCHOLARSHIP BEYOND CANADA'S BORDERS

By Kim Luke

Political scientist David Cameron is an expert on constitutional issues who takes lessons from Canada´s experience with federalism to the world. He assists countries that are emerging from acute ethnocultural conflict to reform their governance structures by introducing forms of democratic federalism. David has advised the Government of Sri Lanka and the Tamil Tigers on federalism and constitutional reform and visited both the government and Tiger-controlled territories of Sri Lanka many times, attending peace talks

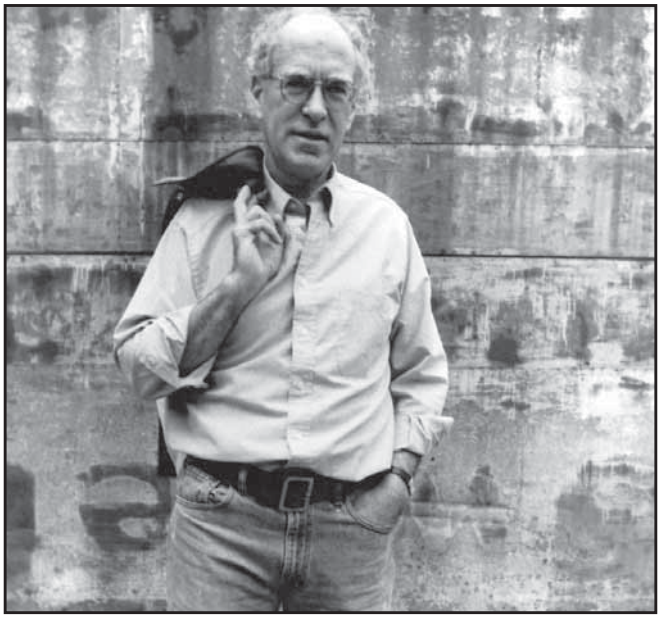


photo by David Street

and giving public seminars and training sessions. He has also advised the Estonian government on constitutional reform and the different levels of government in India on the management of their federation. David has travelled to Baghdad on behalf of the National Democratic Institute for International Affairs in Washington to help lay the groundwork for a new Iraqi state. In addition to consulting with senior ministers and staff of the interim government, he gave a "crash course" on federalism to 50 political candidates, explaining what it is, how it has been put in place by other countries and how it might be adapted for Iraq. He has provided advice on the drafting of the Iraqi constitution and consulted with ministers, senior officials and academic administrators and faculty on a series of three-week courses in Amman on federalism given to about 70 Iraqi academics in law and political science, who then introduce what they learn into their respective universities´ curriculum. David was recently asked to lead the governance component of the Jerusalem Old City Initiative, which is seeking to develop a workable model of political, economic and security organization for that city that might help to address the conflicting aspirations of Israelis, Palestinians and the international community.

Kim Luke is director of communications in U of T's Faculty of Arts and Science.

RON DEIBERT'S CITIZEN LAB

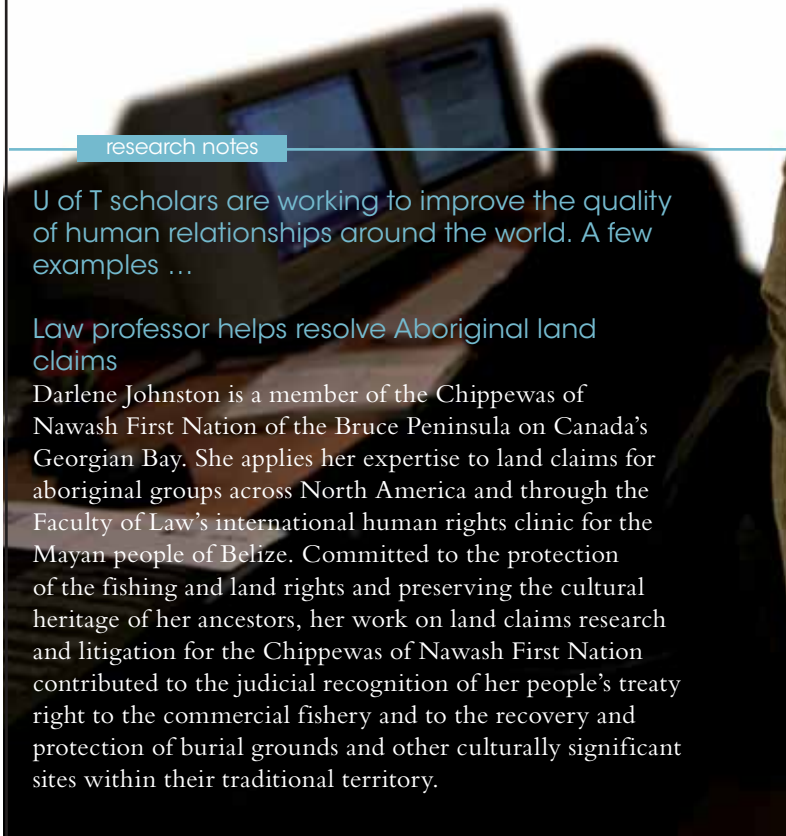
Combats Internet Censorship and Surveillance

By Jenny Hall

There is an audible buzz in Ron Deibert's basement laboratory in the Munk Centre for International Studies. Researchers are pounding away at banks of humming computers and a large fan is working overtime to cool the technology-laden subterranean space. There's an oversized globe in one corner, which, as it sits in this high-tech room, is a perfect metaphor for the work that goes on here. Deibert is a political science professor who's been called everything from the "Hacker Prof" to the "Net Ninja." He's making a name for himself as a scholar-activist who marries a deep humanitarian commitment with a technological acumen that you'd expect to find on an episode of the X-Files.

Deibert and his group of programmers, artists and social scientists are focused on exposing and circumventing Internet censorship and surveillance worldwide. Much of the group's work is conducted on behalf of the Open Net Initiative, a collaborative project of U of T and Harvard, Oxford and Cambridge Universities. The group has attracted funding from financier George Soros and the MacArthur Foundation.

"We tend to think of the Internet as one seamless environment through which we surf," says Deibert, explaining that most of us take freedom of information for granted.



research notes

U of T scholars are working to improve the quality of human relationships around the world. A few examples …

Law professor helps resolve Aboriginal land claims

Darlene Johnston is a member of the Chippewas of Nawash First Nation of the Bruce Peninsula on Canada's Georgian Bay. She applies her expertise to land claims for aboriginal groups across North America and through the Faculty of Law's international human rights clinic for the Mayan people of Belize. Committed to the protection of the fishing and land rights and preserving the cultural heritage of her ancestors, her work on land claims research and litigation for the Chippewas of Nawash First Nation contributed to the judicial recognition of her people's treaty right to the commercial fishery and to the recovery and protection of burial grounds and other culturally significant sites within their traditional territory.

"But depending on from where you access it, you get a completely different picture. Most people don't think much about what happens on the Internet after the information leaves their computer. They send an e-mail and it's gone. They search for information and they get it. But if you follow the connection down the fibre optic cable and through the Internet exchanges and so on, you can see that all along the way there are opportunities to monitor, filter and intercept."

The group borrows its methodology from state intelligence organizations, using a combination of intelligence gathered inside countries that practice censoring, and technical testing, both in the field and remotely from the lab. Like scholarly 007s, Deibert's team has even surreptitiously installed black boxes containing computers inside censorious regimes, which they can then access remotely. "It's very much like being a forensic scientist, tracking down and exposing what governments are doing online," says Deibert.

The group's research effort culminated in the release of psiphon, open source software that operates using social networks of trust. Users in uncensored locations install psiphon on their computers and give the connection information to family or friends in censored locations, allowing them to surf the Internet through the computer in the uncensored location. "Psiphon overcomes one of the biggest problems with other types of circumvention technology," says Deibert, explaining that most attempts rely on large proxy servers which are eventually discovered and shut down by governments. "psiphon is below the radar because there isn't one singe node or point of access. There are literally thousands of them operating on networks of trust with maybe four or five people on each node. So while a government could conceivably shut down one psiphon node, it can't shut down the entire network."

Developing software is all in a day's work for Deibert, who sees everything he does as part of the same mission. "Some people do pure research, some people do policy work, some people do advocacy. Here at the Citizen Lab we do all three. Everything that is done in the Citizen Lab is done with an orientation toward human rights. "Our view is that by default, people should be able to choose for themselves what information they want to access."

Check out psiphon at http://psiphon.civisec.org

Jenny Hall is a writer with U of T's Research Office. (This story originally appeared in Edge*, U of T's research magazine, Winter 2007)*

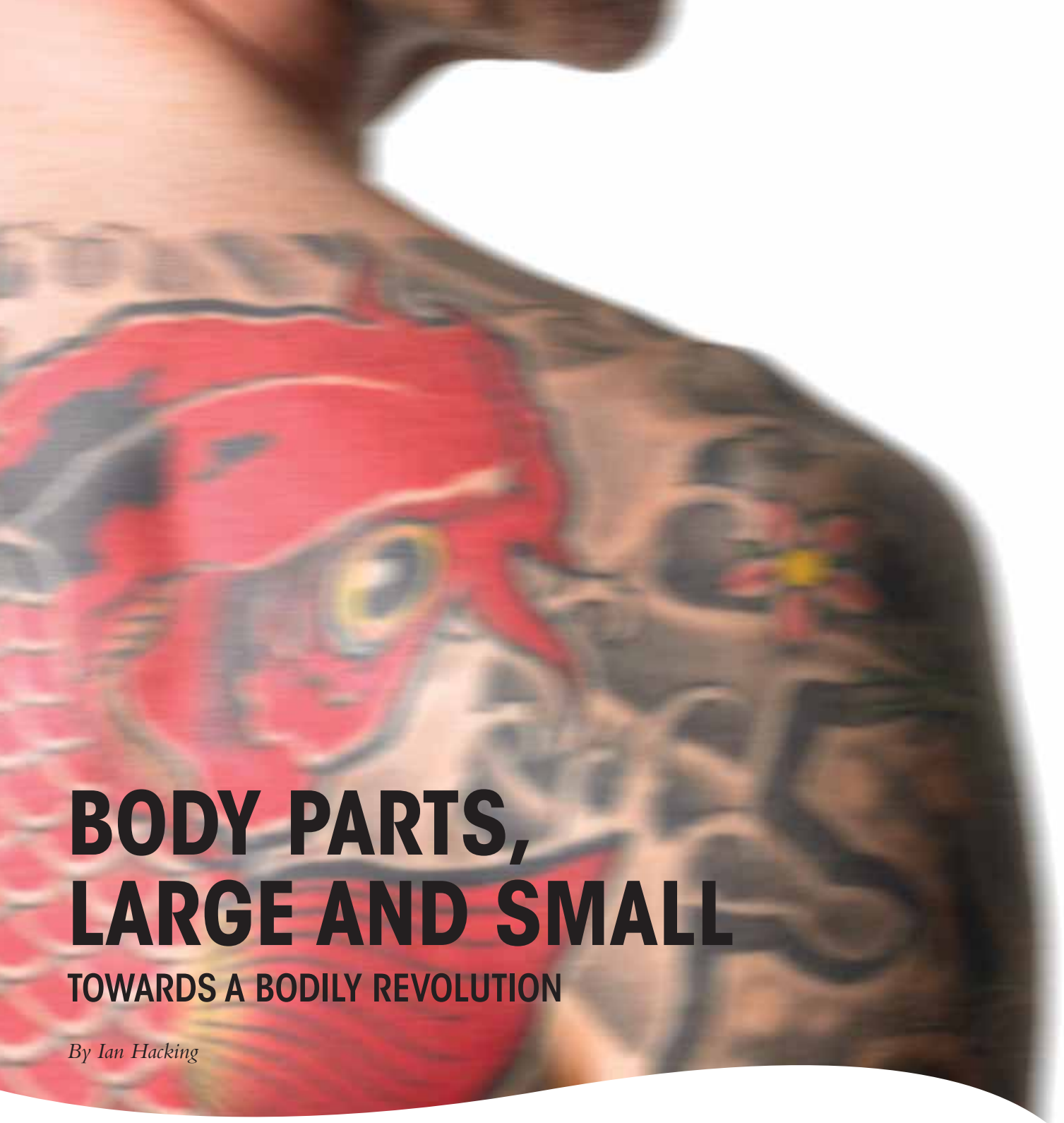
Reading founding scriptures deepens understanding

Philosopher Robert Gibbs, director of U of T's new Jackman Humanities Institute is involved in a project that sees individuals of various backgrounds reading the founding scriptures of the Jewish, Christian and Muslim traditions as a way to deepen understanding of one another's cultures, including religious and legal traditions.

Law students protect international human rights

The Faculty of Law's international human rights program (IHRP) sends approximately 25 students each summer to developing countries to work alongside international human rights practitioners at governmental, non-governmental, community and United Nations organizations. Since the program was founded in 1988, with funding from both the Faculty of Law and private firms, IHRP has placed more than 145 student interns with organizations in more than 30 different countries. The goal is to train and develop the capacity of students in the promotion and protection of international human rights through advocacy, activism, research and education.

| photo by William Ciccoioppo



BODY PARTS, LARGE AND SMALL

TOWARDS A BODILY REVOLUTION

By Ian Hacking

Among historians of medicine, there is a widespread doctrine, popularized by Michel Foucault, that, around 1800, the body came to be seen as constituted and defined by organs. People started to follow Bichat's maxim, "Open up a few corpses!" The medical gaze no longer saw through bodies to their humours, in balance or imbalance, but rather began to look at internal organs and tissues. No longer were illness and disease a matter of the whole body; rather they were located in body parts and their pathologies. The knowledge that some of these parts might be injured or ill did not help much. Aided by bandages and splints, bones would repair themselves; for a full 150 years, however, we could not do much for diseased or defective body parts. That has all changed.

We have learned how to repair and transplant organs. We can buy them, somewhat illicitly, if we are rich enough, and sell them, if we are poor enough. Genetic material is routinely transferred from an organism of one species to an organism of another species: from flounder to plant, from bacterium to tree—ordinary taxonomy is no barrier at all. And if, as common metaphor has it, genes are information, then the population of Iceland has leased its genetic code to a joint American-Icelandic corporation. Furthermore, experts predict that we are on the verge of being able to grow body part repairs from stem cells or from cells from our own bodies.

These possibilities, only a few years old and still developing, may produce a complete revolution in the way in which we conceive our relationship to our bodies. Once we could alter a body only superficially: through exercise or sloth, or by amputating, painting or mutilating it. The body's surface was, thus, an objective "other," and we could not get inside effectively except by eating and drinking. Now, with advances in surgery and genetic engineering, we can.

> *"we are on the verge of being able to grow body part repairs..."*

On one end of the scale, we have revised our conception of what it is to be dead, making up a new criterion—namely, brain death—chiefly because of our new relationship to interchangeable body parts. We had to decide when it was all right to take a living organ from a body that was still "alive," that is, when heart and lungs were still at work with the aid of a ventilator.

At the other end of the scale, we dream of fixing the genetic material of living people in order to treat or cure their inherited illnesses. And we imagine that, before a child is even born, we shall be able to modify its genes in order that it may develop into a healthier specimen of the human race—a different person, in truth, a person whose life experiences from birth are profoundly different, and who, in growing up, will develop a character different from what it would have had had there been no intervention.

In other words, we imagine a different soul growing into existence. I do not think of the soul as some immutable centre of being, but as character evolved in contact with a world full of people, things and events. If a great impairment or limitation is removed or ameliorated before birth, then the subsequent person's contacts, relations and activities will be profoundly affected. Those who alter the genetic potential of a fetus create the space for a new soul to develop.

Our bodies, as a consequence, are likely to become more other. While Descartes' vision of a fundamental division between mind and body may be unpopular nowadays, it is seldom noticed that, as a result of our technological prowess in organ transplants, the genome, genetic engineering, clones and the farming of stem cells, we seem to be edging closer to fulfilling a simplistic version of a Cartesian dream, whereby bodies are just machines in space, composed of machine parts, while the mind, the self, the soul is another substance, which itself inhabits another realm. We are experiencing, in short, a bodily revolution, of which the genetic revolution of our times is only a part. The bodily revolution is a revolution in the sense of the reinstatement of a fully Cartesian attitude to the body as machine. The body has now become a machine, subject to engineering projects, large and small.

Ian Hacking, a Companion of the Order of Canada, is a professor emeritus of philosophy. He also holds the Chair of Philosophy and of the History of Scientific Concepts at the Collège de France. He is the author of Rewriting the Soul and Taming of Chance. *(The above is excerpted from an article which originally appeared in* Idea&s: the arts & science review, *Volume 2, Number 2)*

research notes

Research into health at U of T spans many disciplines and faculties and also involves scientists working in 10 fully affiliated teaching hospitals. Some recent highlights include...

Tackling global health inequities

Gopal Sreenivasan, the Canada Research Chair in Justice and Health, is harnessing moral philosophy to tackle the dire discrepancies of global health such as vastly differing life expectancies. He is also involved in developing a framework for deciding which services should be covered by Canada's health care system.

Health care culture clash

Zubin Austin of the Leslie Dan Faculty of Pharmacy is helping prevent "culture clash" between pharmacists and physicians by developing training programs that integrate pharmacists into family health care teams. Collaborating with colleagues at other universities, Austin hopes to develop a more comprehensive approach to family medicine, one that integrates the expertise of a wide range of professionals.

Primate pathogens

An anthropologist at the University of Toronto Scarborough, Michael Schillaci studies disease transmission between humans and monkeys in urban settings in Asia. His research group was the first to document the transmission of a primate retrovirus to a human in Asia. Given that emerging infectious diseases such as SARS tend to come from animals, his work is crucial to understanding the context of disease transmission—and to developing guidelines for reducing exposure.

Mimicking a good gene defect

Rachel Tyndale, the Canada Research Chair in Pharmacogenetics, discovered an enzyme called CYP2A6 that slows down the metabolism of nicotine, making a person who has the enzyme more likely to smoke. Counter-intuitively, those with a defective variation of CYP2A are less likely to smoke, so Tyndale and colleagues are trying to mimic the defect in the lab. The result could be a customizable drug therapy to help smokers quit.

NEW ALZHEIMER GENE DISCOVERED

By Arlene Clement

An international effort led by scientists at the Centre for Research in Neurodegenerative Diseases (CRND) has isolated another gene responsible for Alzheimer's disease. The five-year study, published in *Nature Genetics* in February 2007, involved researchers at Columbia University, Boston University and the Mayo Clinic and tested over 6,000 DNA samples from Caucasians, Hispanics, Israeli-Arabs and African Americans. It uncovered two consistent patterns that linked the SORL1 gene to people afflicted with Alzheimer's. "What we found is this gene is robustly associated with increased risk for common forms of late onset Alzheimer's disease in several different ethnic groups," says Dr. Peter St George-Hyslop, CRND Director. This isn't the first Alzheimer's gene to be identified by researchers at the CRND. In 1995 they identified two defective genes that cause aggressive early-onset forms of Alzheimer's (presenilin 1 and 2), and in 1990 they were the first to show Alzheimer's is a complex disorder with many causes, some of which are genetic.

Future work will be needed to pinpoint the exact regions of the SORL1 gene responsible for initiating the Alzheimer's process. According to St George-Hyslop, "Each new piece of the puzzle helps solve the overall puzzle faster and brings new opportunities for imaginative new approaches to diagnosis and treatment."

Arlene Clement has written for various U of T publications. (This article originally appeared in UToronto Medicine.*)*

STEM CELL

LICENSING DEAL POSITIONS TORONTO AS WORLD LEADER IN THE TECHNOLOGY.

U OF T RESEARCH IS BROUGHT TO MARKET

By Karen Kelly

A $20-million deal to license Canadian stem cell technology in the U.S., announced June 21, underscores the Toronto area's global leadership in stem cell research. Under the agreement, Tissue Regeneration Therapeutics Inc. (TRT), an emerging Canadian life sciences company, will exclusively license its human umbilical cord perivascular cell (HUCPVC) technology to Stem Cell Authority Ltd. for family stem cell banking in the U.S. The licensing fees and annual minimum royalties will exceed $20-million (Cdn) over the next four years. The technology originated at the University of Toronto and has been offered to the public in Canada since March 2007 through a licensing agreement between TRT and Toronto-based CReAte Cord Blood Bank (CCBB).

"Toronto is the first place in the world to bank perivascular mesenchymal stem cells from the human umbilical cord and we are extremely pleased to now be able to provide this opportunity to parents across the U.S.," said Professor John E. Davies at U of T's Institute of Biomaterials and Biomedical Engineering, senior inventor of the technology. "This is a great example of how a university can facilitate the translation of professorial research from the university laboratory to commercial reality for the benefit of the public."

Currently, TRT technology is available to the Canadian public through CCBB, which markets HUCPVCs as PeristemT. Once the baby is born, a health professional simply collects the cord tissue and places it in a bio-container supplied with a nutrient solution and then ships it to the CReATe laboratories for processing and storage.

A technician at the laboratory uses a proprietary process to remove the cells from the cord tissue and stores them for future use. Unlike cord blood stem cells, which can also be harvested, mesenchymal cells are the building blocks for the muscle, bone and connective tissues of the body. HUCPVCs also serve as regulators of the immune system. Published uses of mesenchymal cells in cell therapy include combating auto-immune and inflammatory diseases (Crohn's, juvenile diabetes and rheumatoid arthritis), cancer, heart disease and tissue engineering.

> "*This is a great example of how a university can facilitate the* ***translation of professorial research*** *from the university laboratory to* ***commercial reality for the benefit of the public.***"

While the HUCPVC technology is still in the pre-clinical stage, TRT CEO Dr. Jeffrey Turner says that its development program designed to treat auto-immune and inflammatory diseases offers parents a type of "biological life insurance" that could one day treat all the diseases mentioned above and more. "What excites me is that our growing stem cell company in Canada is now offering its services to the U.S., which is essentially half the world market," Turner says. "We are now looking to expand into the Middle Eastern and Australian markets."

The HUCPVC breakthrough was announced in 2005 when the Davies research group at the University of Toronto discovered these stem cells in an uncharted part of the umbilical cord - the connective tissue immediately surrounding the blood vessels in the cord. The great advantages of this source of mesenchymal stem cells, compared with current techniques using surgically extracted cells from bone marrow, lie in sourcing them from tissue that would otherwise be thrown away at birth, their very rapid proliferation and the huge numbers of harvested stem cells.

Karen Kelly is a writer in the Office of Strategic Communications. (This article is reprinted, with permission from U of T's Bulletin.*)*

research notes

Researchers discover how malaria, HIV combine to adversely affect pregnant women

More than a million people die from malaria every year. The disease is particularly devastating to HIV-positive pregnant women because HIV infection aggravates the condition. Kevin Kain of the Department of Medicine is lead author of a study that discovered how HIV targets the immune response to malaria in pregnant women. The findings may help in the development of a vaccine for pregnancy-associated malaria.

Low maternal B12 levels affect fetuses

Pregnant women with low levels of vitamin B12 are three times more likely to deliver babies with neural tube defects such as spina bifida and anencephaly, says Joel Ray, a professor in the Department of Medicine and a physician at St. Michael's Hospital. This was the first comprehensive study to examine this link while adjusting for folic acid (which is known to reduce the risk of neural tube defects) levels.

Pills and politics

A former researcher for the United Nations and the World Bank, Jillian Clare Cohen is focused on exposing corruption in the global distribution of drugs—from the manufacture of counterfeit drugs to improper pricing. A professor of pharmacy, she brings an interest in the politics of drug access globally to her work, which she hopes will help the one-third of the world's population that does not have access to drugs

|photo by Caz Zyvatkauskas

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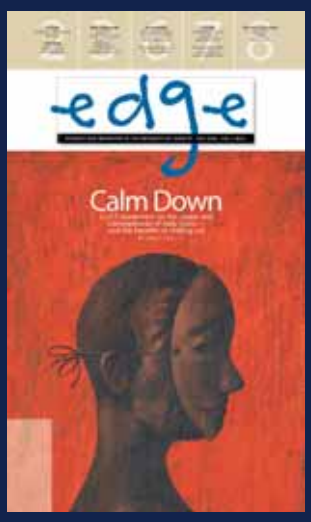

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UNIVERSITY OF TORONTO

UNIVERSITY OF TORONTO BY THE NUMBERS

- Established in 1827
- 70,143 students (62,097 full-time)
- 11,807 faculty and staff
- 422,000 alumni
- Hundreds of undergraduate programs
- 75 PhD programs
- 17 professional faculties
- 10 fully affiliated teaching hospitals
- Operating budget: $1.187 billion
- Research grant and contract support: $623 million
- Library has over 15 million holdings and is one of the top 4 research libraries in North America
- International exchange and study abroad agreements with more than 30 countries including Australia, Austria, Barbados, Chile, China, Czech Republic, Denmark, England, Estonia, France, Germany, Ireland, Israel, Italy, Jamaica, Japan, Mexico, The Netherlands, New Zealand, Norway, Poland, Scotland, Singapore, South Korea, Spain, Sweden, Taiwan, Trinity and Tobago, United States

LOCATIONS

- St. George campus (downtown Toronto): 50,871 students
- U of T Scarborough: 9,603 students including joint programs with Centennial College
- U of T Mississauga: 9,669 students including joint programs with Sheridan College
- Institute for Aerospace Studies in northwest Toronto
- Dunlap Observatory in Richmond Hill
- Koffler Scientific Reserve at Jokers Hill, King Township

RESEARCH ACHIEVEMENTS

- U of T professors produced more publications in the fields indexed by Thomson Scientific than faculty at any other public research university worldwide (from 2000-2004). Including the leading private American universities, which are extraordinarily well resourced, the University of Toronto stands second only to Harvard in publications among all private and public universities.
- U of T faculty account for more than half of all Canadian members of both the American Academy of Arts and Sciences and the National Academy of Sciences. Our success is similar with Britain's renowned Royal Society of London, where 44 per cent of the Canadian members come from the University of Toronto.
- Since 1980, U of T faculty members, who constitute only about seven per cent of the faculty at all Canadian universities, have won at least 25 per cent of the Steacie, Killam and Molson Prizes. They have also won 29 per cent of the highest awards given out by the federal research councils in Canada.
- With our hospital partners, U of T is the largest research entity in Canada and the third-largest in North America, spending $3 million a day on creating new knowledge.
- U of T researchers have:
  - developed first electronic heart pacemaker, artificial larynx, single-lung transplant, nerve transplant and artificial pancreas
  - isolated gene that allows plants to grow in salt water
  - developed the chemical laser
  - developed the anti-blackout suit, later adapted to create the astronaut space suit
  - created the infant cereal Pablum.

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