

THE KEY

LAURENTIAN UNIVERSITY'S RESEARCH MAGAZINE



**DAVID PEARSON
ON CLIMATE CHANGE**

Green algae, green economy

Boosting children's self-esteem

THE FIRST WORD



Recently, the presidents of Canada's five largest universities proclaimed that research and graduate programs are best left to them and that the others should be satisfied to be undergraduate institutions.

I beg to differ! Not only do we have a significant impact on northern Ontario in providing graduate education in a wide range of programs and in delivering research that has great significance, the scope of our research goes well beyond our immediate community.

Laurentian, a bilingual and tri-cultural university, has been Ontario's fourth-fastest growing university since 2000, its enrolment rising from 6,000 to 9,000 students. The university attracts more students every year from northeastern Ontario than the next five universities combined, and its success is increasingly being noticed outside the region. Today, half of Laurentian students come from the rest of the province, the country, and the world.

Indeed, we are one of the founding partners in the Sudbury Neutrino Observatory, which studies the mysteries of the universe. We have shown through our research and our efforts that we can rehabilitate a severely damaged biosphere. Our research in rural and northern health is outstanding. We are sitting on the largest mining camp in the world and we are providing the world with our knowledge about mining sustainability through our mineral and geological expertise.

I hope that you will agree in reading the third edition of *The Key* that Laurentian University can stand tall and be counted as a medium-sized university that is thriving as a place for quality learning and cutting-edge work in research, development, and creativity.

Patrice Sawyer
Vice-president, research and graduate studies



Growth in research activities

For the sixth year in a row, we have been ranked among the top 35 universities in Canada in terms of research activity. This is a significant achievement for a university of our size.

Areas of research

While research at the university encompasses many disciplines, Laurentian has identified five areas of strategic focus:

- REGIONAL ECONOMIC, POLITICAL, SOCIAL AND CULTURAL DEVELOPMENT
- ENVIRONMENTAL SCIENCES
- HEALTH
- MINERAL RESOURCE
- UNDERGROUND SCIENCES

THE KEY

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On the COVER



David Pearson (science communication program director) and student Sophia Maio explore the butterfly gallery at Science North, the nationally recognized science centre that partners with Laurentian to offer this unique program.

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One canoe stroke at a time

Aboriginal youth get adventurous through Laurentian's niche outdoor adventure leadership program

By Laura E. Young

Laurentian researchers could have made the two-hour drive to Manitoulin Island's Wikwemikong Unceded Indian Reserve and talked to youth about leadership skills in the classroom. That would have been the easy thing to do.

Instead, researchers and their team in Wikwemikong took them out for 10-day canoe excursions on the waters of Georgian Bay to discover the true meaning of terms such as resilience, well-being, and leadership.

The canoe trips are a key component of the Wikwemikong Outdoor Adventure Leadership (OALE) program, a research project that cultivates resilience in Aboriginal youth through leadership training. Collaborating on the OALE program are Mary Jo Wabano, the (former) program manager for youth services at the Wikwemikong Unceded Indian Reserve, and Stephen Ritchie, a professor in Laurentian University's outdoor adventure leadership program.

OALE prepares youth as leaders, promotes culture and community, and promotes resilience and well-being. In 2009, participants conducted three, 10-day canoe excursions with select youth, ages 12 to 18. They paddled past traditional lands, pictographs, and old village sites along Georgian Bay.

Ritchie and Wabano presented their work – entitled *Developing Aboriginal Youth Resilience and Well-being through Outdoor Adventure* – at the fifth International Adventure Therapy Conference in Edinburgh, Scotland, in September 2009. Ritchie is currently a PhD candidate in Laurentian's School of Rural and Northern Health. The research is funded through the Indigenous Health Research Development Program (IHRDP), Ontario's Aboriginal research centre.

 Laurentian University
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MARY JO WABANO (LEFT) AND STEPHEN RITCHIE (RIGHT) EXPLORE THE WATERS OF GEORGIAN BAY AS PART OF THEIR WORK WITH ABORIGINAL YOUTH AND THE WIKWEMIKONG OUTDOOR ADVENTURE LEADERSHIP PROGRAM.

According to Nancy Young, Laurentian's Canada Research Chair in Rural and Northern Health, there is a body of research that examines how outdoor adventure leadership experiences improve an individual's resilience. Yet Ritchie's research is the first within this field to use a participatory research approach and to focus specifically on Aboriginal youth, she says. Early findings suggest its value as an intervention technique among a high-risk population. "His research is breaking new ground in terms of research methods and health promotion interventions concurrently. It is happening very rapidly and is extremely exciting for his committee and the community partners."

Since 2005, Laurentian University and Wikwemikong have collaborated on community-based research, yielding a large body of work. Ritchie wondered what role outdoor adventure leadership could play. Wabano wanted to put into practice the leadership manual they had developed. "Just based on the pilot project, it had an impact on our young people," she says.

They paddled past traditional lands, pictographs, and old village sites along Georgian Bay.

The canoe trips, launched in 2009, are based on key OALE program principles, such as the traditional Seven Grandfather teachings, and included solo canoe paddles and reflective writing time. The journeys ended with a community welcome. "We had a celebration feast, a time for storytelling, and then program graduation awards issued to the youth by leaders in the community. Those arrival days are powerful memories for me now," says Ritchie.

The tents and outdoor gear have been put away, but the heart of OALE continues to beat in the community. Preliminary analysis of the data confirms positive changes in participants, says Ritchie. Two more trips are scheduled in 2010. Other Aboriginal communities are also beginning to express interest in the program, Ritchie says.

Ritchie says the youth seemed unsure about their decision to join the trip – at first. Then, slowly, everyone came together. "It also seemed like there was a turning point during each excursion, by day three or four, where many of the youth seemed to realize the possibility of success, accept their role in the group, and really begin to enjoy the trip, their travelling companions, and the wilderness around them." ❏

SAMPLE SOLO REFLECTIONS

THE RIVER IS LIKE A LEADER

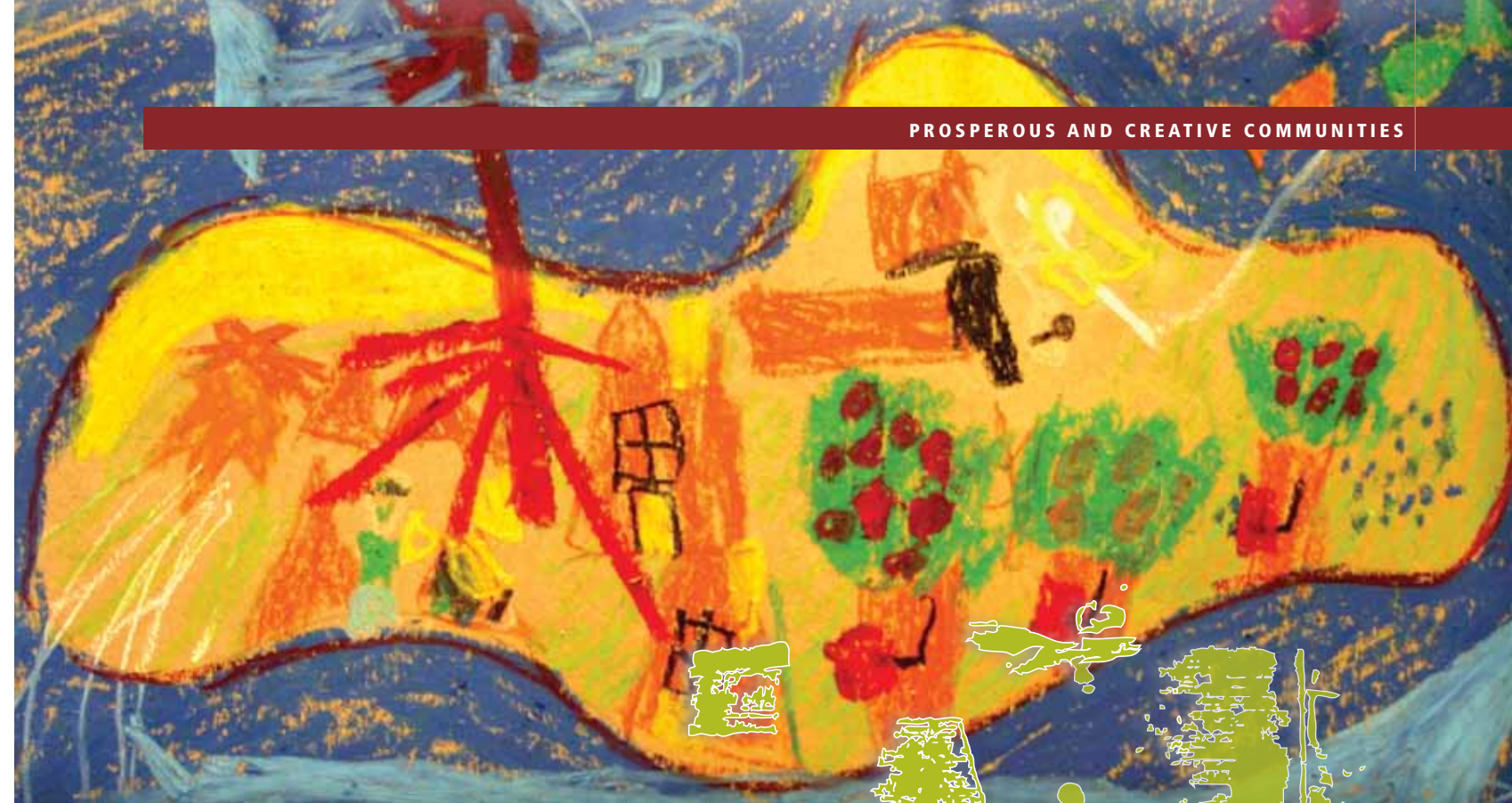
The river is like a leader.
It guided us from place to place.
The river is like a leader.
It introduced us, as if we seen a new face.
The river is like a leader.
It has a constant flow.
The map helped on this one,
it showed us which way to go.
Paddling through the river, made me think a lot.
Paddling through the wind, the rain, the cold & the hot.
Realizing there's so much to life,
So much to see, & so much to do.
Through the good & the bad,
Be strong & make it through.
Be yourself & be proud of who you are.
Be a leader like the river.
Cause in life, it'll take you far.

ASHLEY JACKO, Age 15
JULY 22, 2009

WHAT IF?

What if the birds all flew away?
What if winter was here to stay?
What if we couldn't do anything about it?
What if?
What if the seasons never change?
What if people couldn't age?
What if?
What if bad decisions are always made?
What if no one is ever there to aid?
What if you couldn't change these outcomes?
Changes may come and go, or here to stay, but the good and possible ones make you a better person each and every day.

PIERCE MANITOWABI, Age 15
AUGUST 13, 2009



Resilience in children ENHANCED through Art

By Laura E. Young

On the surface, the arts program for children run by Diana Coholic looks like a great way to keep kids busy after school hours with activities such as painting, drawing, meditating, and writing.



[Diana Coholic]

But there is so much more to Coholic's Healing Arts Program (HAP) than paint and paper. Administered weekly as part of her social work research, in two-hour blocks of time, this creative period provides a deeper, even vital, outlet for the children who participate. Since 2006, Coholic and the HAP team have run and refined an arts-based program to help high-need children develop their self-awareness, self-esteem, and resilience. Sessions, run out of Laurentian's multidisciplinary qualitative research lab, target disadvantaged children, teaching them skills to help them cope with the challenges they face in their daily lives.

As one young child involved in the program said: "The group helped me get to know myself a little bit better, and it's helped me make some decisions ... based on my behaviour and stuff. My foster parents have said they've seen enormous positive changes."

In early 2009, Coholic received a grant of \$221,340 from the SickKids Foundation to pursue research into the effectiveness of holistic arts-based group approaches for personal development and resilience.

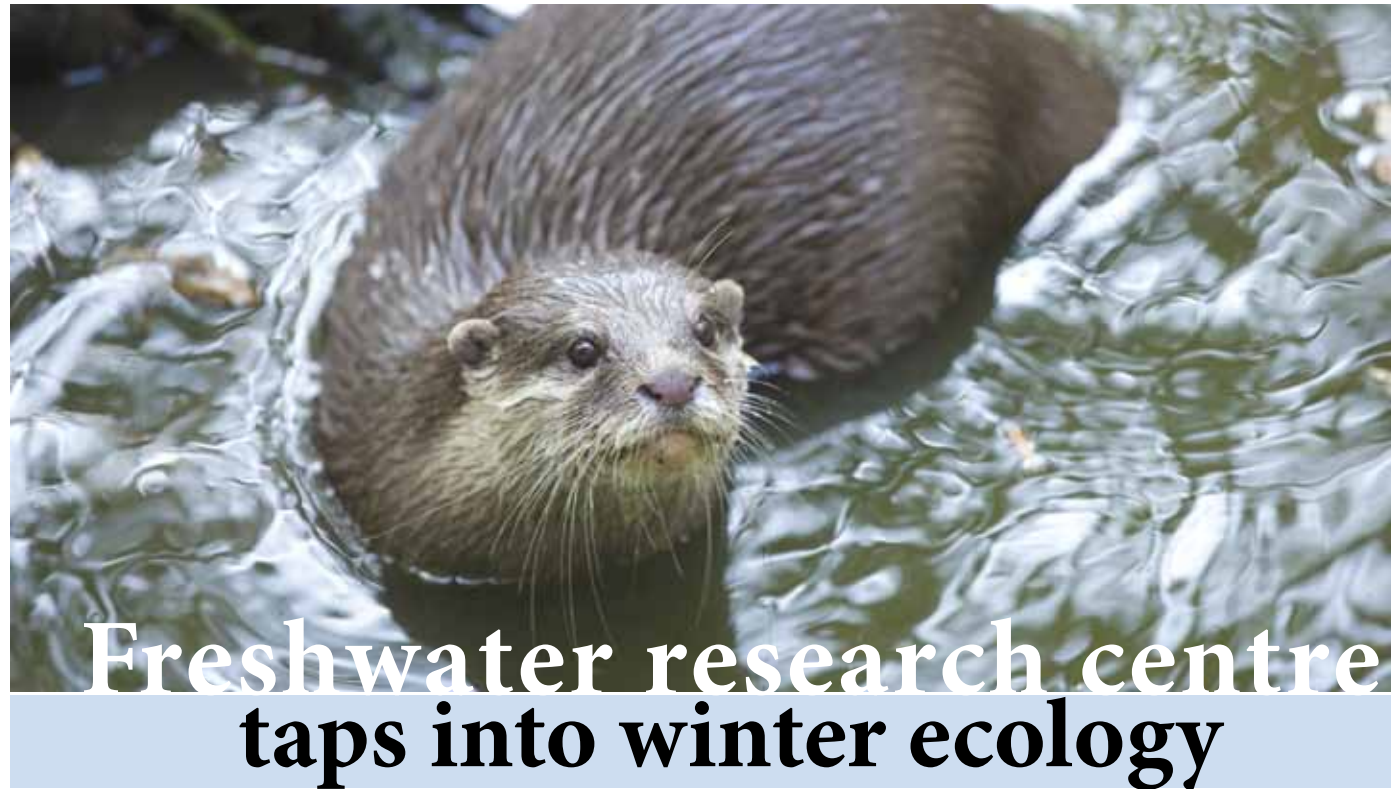
That September, Coholic embarked on the next three-year phase of the project. First, Coholic had to build the HAP team, hiring extra students and practitioners. There were six, 12-week groups over the fall. More groups are scheduled over 2010. There are currently nine undergrad and graduate

students working on the research with Coholic, including students from the concurrent education program and a social work student who is funded by a CIHR Health Professional Student Research Award (for student research training). Coholic has also hired several community practitioners.

The HAP program will reach approximately 36 children per year, or, 108 over the three-year phase. Each group consists of four children, many of whom are referred through either the Children's Aid Society or the Child and Family Centre of Sudbury, which came on board as a community collaborator in 2009. The children hail from the Greater Sudbury area, and range in age, from 8 to 13. "They are all high-need children with various problems and issues," Coholic says.

Coholic's research is readily available to practitioners through a DVD and training manual. In 2009, Hoi Cheu, director of Laurentian's Centre for Humanities Research and Creativity, produced the training DVD. In March 2010, Coholic's book on the program, *Art Activities for Children and Young People in Need – Helping Children to Develop Mindfulness, Spiritual Awareness, and Self-Esteem* will be published through the UK publisher, Jessica Kingsley.

Some of the children Coholic sees have difficult life situations. "It makes it hard for us to end the group with them. Some of them are very sad when it does end. On the other hand, we hope that we are offering some methods that will be helpful for them in the future, and certainly a positive and affirming place to be." ❏



By Suzanne Charron-Violette

Laurentian's new research centre for freshwater protection and restoration, perched atop a small peninsula jutting into Ramsey Lake, is strategically positioned to monitor and gather research on water quality. This research will be global in scale and will lead to new strategies to speed the recovery of industrially damaged ecosystems. Known as the Vale Inco Living with Lakes Centre (VILWLC), it will become the new home for Laurentian's Cooperative Freshwater Ecology Unit.

There is another reason the centre is strategically located – the local climate. Sudbury still experiences four distinct seasons, including a cold winter, which means the centre can conduct original and innovative research on water quality and its connection to animal ecosystems during the winter months. Currently, Canadian research has barely scratched the icy surface into winter conditions in a natural environment.

Leveraging its location, the Vale Inco Living with Lakes Centre will include a specially designed winter laboratory, the only one of its kind in Canada, says John Gunn, professor and Canada Research Chair in Stressed Aquatic Systems. The lab will take advantage of winter conditions, with tubes and pipes floating under the ice, pumping lake water into the building. "Rather than taking 10° C water from city pipes, we get nearly 0° C water so we can run our experiments under more natural winter conditions," says Gunn, "Winter is being brought into the building."

Our freshwater ecosystems are especially vulnerable to environmental stressors, including the expansion of industries throughout the world, urbanization, atmospheric contaminants, and global climate change. By knowing how aquatic ecosystems function in winter conditions and how winter water quality affects animal habitat, biologists may be able to better predict the impact of warming temperatures – even a change of 1° C can have a dramatic impact.



“Winter is being brought into the building.”

– JOHN GUNN

Fish, turtles, frogs, otters, and beavers are some of the animals that live at nearly 0° C in the wintertime. The first fish experiment in the winter lab will involve hatching walleye eggs and observing their development in water of 1° C or 2° C to determine changes in reproductive health, such as lipid content, that may be affected by temperature.

Laurentian is already teaching courses on winter ecology, and the new lab will provide controlled monitoring of winter ecosystems. Jacqueline Litzgus, an associate professor in the department of biology, is excited about the winter laboratory. A turtle specialist, she plans on developing winter ecology teaching labs on-site. "I could see my group using the lab for research and teaching," Litzgus says. "Lately, we have been studying hibernation in the wild of turtle species at risk, including wood turtles, Blanding's turtles, and spotted turtles. It would be nice to couple some of that field work with more controlled lab studies." ❏

CHANGING MINDS

on climate change

DAVID PEARSON has a few words for climate change naysayers.

By Laura E. Young

Addressing a room full of science writers, David Pearson explains the science of climate change. Pearson begins by dividing the next 100 years into 20-year increments. An expert geologist and science communicator, he uses visuals to great effect in his presentations. A breathtaking view of Earth from space projects overhead, resplendent in greens and blues, but slowly, the image begins to fade to brown and grey as the century advances; parts of the world become drier; others are flooded. Pearson's thoughts become flooded, too. He pauses as though his own words are hard to digest. Then, he continues.

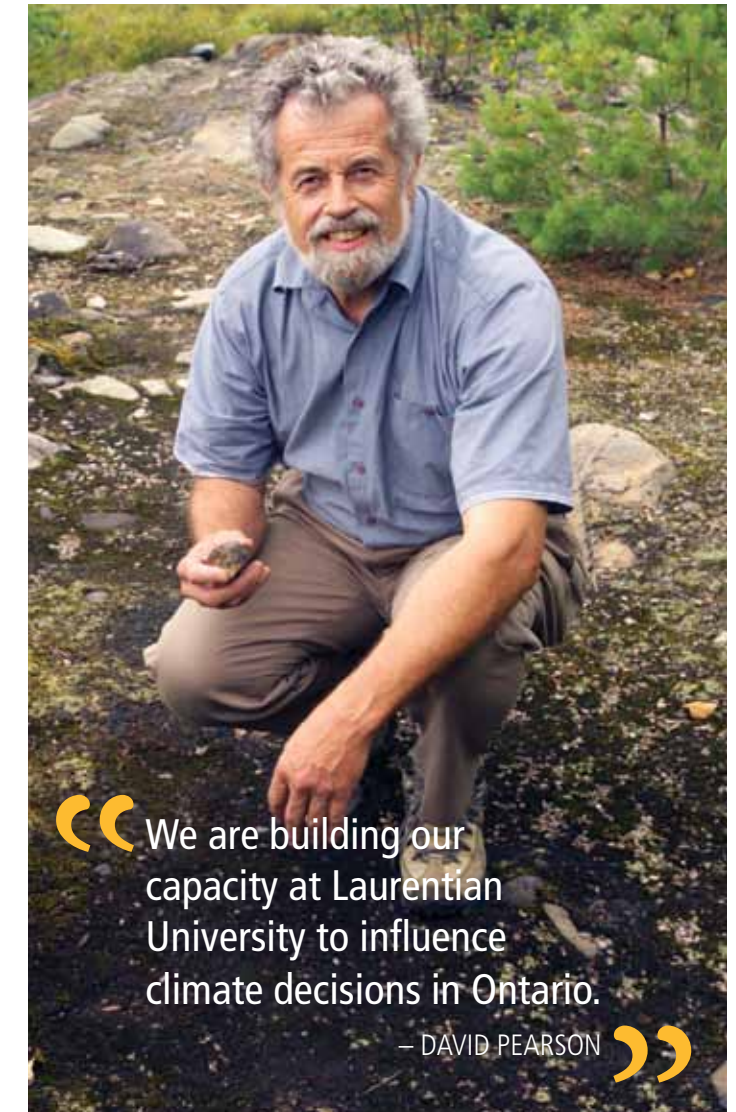
Affectionately known by many as Dr. Dave, Pearson is co-chair of the Ontario premier's panel on climate change adaptation and a member of the Science Advisory Panel on the Far North Initiative with the Hudson Bay Lowlands and the Boreal forest. The former director of Science North, Pearson currently teaches in Laurentian's science communication program. He has also been a commentator at CBC Radio, hosted a science show on TV Ontario in 1975, and created the program "Down to Earth" for CTV in the 1990s.

Back in those days, environmental messages revolved around composting, blue boxes, and recycling. Remember acid rain? It was one of many seemingly discrete environmental threats causing a stir in the 1970s and 1980s. The crisis had yet to go global in scale.

These days, global climate change could mean the end of the world as we know it. Or, is the fear overblown? In North America, media coverage on climate change has been conspicuously muddled and upsetting, and after three decades of growing panic, some people are beginning to tune out, while others are questioning the scientific validity. This is a precarious time for those communicating the effects of climate change – and handling the sceptics.

In November 2009, the climate change debate reached a new stage, now referred to as "Climategate," when a computer hacker broke into the computer systems used by the Climatic Research Unit, finding a decade worth of information. It appeared as though some research from the UN's Intergovernmental Panel on Climate Change and various government agencies had been withheld to strengthen the case for man-made global warming. The incident caused quite a stir. People began questioning climate change and the scientific validity behind global warming, and whether it is, indeed, human induced. After all, cows were eating grass in Greenland during the last warming period about 1,000 years ago.

Pearson tackles such naysayers head on, simply challenging critics to show how a changing atmosphere will *not* affect climate. The science



“We are building our capacity at Laurentian University to influence climate decisions in Ontario.”

– DAVID PEARSON

cannot be ignored. "Show me the science that proves adding carbon dioxide will not cause the atmosphere to become warmer. It is like adding grains of sugar to a cup of coffee and arguing that it doesn't make it sweeter."

The UN Climate Change conference in Copenhagen in December 2009 hurt efforts to reduce greenhouse gases, Pearson says. "Good people were left exhausted, frustrated, and feeling hopeless." In order to deal with that, he focuses on what can be done in Ontario to make a difference. "We are building our capacity at Laurentian University to influence climate decisions in Ontario through our Ontario Centre for Climate Impacts and Adaptation Resources, and will be making announcements about increases to that capacity in the very near future."

For Pearson, politics and policy-making failed in Copenhagen, not science. "The risk we face is that large areas of the planet will become uninhabitable in the next 50 years. Ontario is rich and climatically fortunate, so can afford to be complacent. On the other hand, I think Ontario is trying to be a leader and Laurentian is redoubling its effort to help make that happen."

Pearson remains engaged by the intellectual challenge of communicating the science and putting all the pieces of the larger picture together. It's just part of his nature to resist doom and gloom. "I continue to feel that we have to try. The quickest way to doom is to give up trying." ❏



Youth safety in the classroom

By Suzanne Charron-Violette and Guylaine Tousignant

Eight youth workers in Ontario lost their lives on the job in 2007, according to Ministry of Labour statistics. Eight lives too many. Also daunting is the fact that youth entering the labour market are injured at rates that far exceed those of adults.

Two years ago, the Youth Workplace Safety Coalition (YWSC) was formed to focus on reducing accidents involving youth working in the labour market. The YWSC brought together Laurentian University, the United Steel Workers (USW) local 6500, the four Greater Sudbury school boards, the Ontario Neurotrauma Foundation, and the University of Toronto to identify how the education system can get the message out to youth to enhance their safety in the workplace.

In November 2009, the YWSC launched the Focus on Youth Safety project – a collaboration involving all members of the coalition. With funding provided by the Ontario Neurotrauma Foundation, the partners are working toward developing a safety learning model for preventing injuries to young workers across Ontario.

The Focus on Youth Safety project standardizes the approach used in schools for health and safety training, targets co-op students, and brings efficiencies in the use of available resources so youth are adequately prepared.

According to the Ontario Safety Standards Association, about 70 per cent of youth will find employment at some point during their high school careers, explains John Lewko, director of Laurentian’s Centre for Research in Human

The Focus on Youth Safety project involves:

- The construction of a series of sector-specific checklists to help teachers and their co-op students entering the workplace to ask the appropriate questions in relation to health and safety;
- An initiative involving co-op students as teachers of health and safety to their peers;
- Professional development focusing on group discussions with former co-op students, and the teachers and employers of co-op students; new materials and resources will be designed to answer knowledge gaps;
- The creation of a roster of retired steelworkers with workplace safety experience to provide students with real-life knowledge of various work settings;
- The integration in the current curriculum of new modules on health and safety in the workplace, with related resources and materials;
- The revision of the Young Workers Awareness Program to reflect the needs of the co-op programs.

Development, and a leading researcher on this issue. “The reality remains that most teachers have not been exposed to the particular work settings that students are experiencing,” cautions Leo Gerard, international president of the United Steel Workers. Arming youth with knowledge in workplace safety may help stem the loss of future lives. ❏

Health research through the eyes of a child

Children should be trusted to speak for themselves when it comes to assessing their quality of life and health. Nancy Young, Laurentian’s Canada Research Chair in Rural and Northern Children’s Health, and professor at Laurentian University’s School of Rural and Northern Health, strongly advocates giving children a prominent voice in research. She has been using a child-centric approach to research into children’s health since the 1990s.

In numerous studies, many national and international in scope, Young involves children directly, allowing them to self-report through carefully crafted surveys. Often, the children who are the focus of research are chronically ill. Yet they willingly assist research by sharing their personal perspectives on topics such as medical treatment and pharmaceuticals.

Though the respondents are willing to participate, the language used in surveys can become a barrier in child and youth self-reporting – if improperly thought through. Firstly, the language must be easily understood by the targeted age group, and geared toward young readers. The issue is exacerbated when surveys are conducted across cultures and even among people who speak the same language, but come from different cultures. Young uses the word ‘sick’ as an example. In Canada, the word means not feeling well, whereas in the UK, it means vomiting. This type of significant difference in meaning of a given word has to be predicted ahead of time and taken into account when creating the survey.



[Nancy Young]

The same holds true with the French language and variations between cultures. A survey developed using Parisian French does not work when applied to Canadian francophone populations. This means, unless measures designed specifically for this group are available, French-Canadian children are often excluded from self-reporting research. Young also tries to avoid giving English surveys to bilingual children, if French was their first language. Evaluating young children in their second language, she says, is “really pushing their cognitive capacity. And if they don’t understand the concepts, then what are you getting in your data? Probably a lot of random error.”

In cross-cultural studies, a generic survey is often translated into the language of the participating children. But such surveys can never be sure of a ‘one size fits all’ application. The translation also has to be cognizant of language nuances depending on the group. “If the questionnaire doesn’t feel like it’s theirs, they don’t buy in; they don’t know what they are doing, so they lose interest pretty quickly,” says Young. To develop appropriate measures, Young’s team spends a lot of time talking to children and listening to the words they use. From these conversations, a child-friendly version is designed and tested to ensure researchers and participants are comfortable using it.

The whole process takes about six months in Canada and up to two years on multi-site, multi-national projects, depending on the complexity of approvals by involved ethics boards.

Is this child-centric approach worth the effort? Young says including children in the research improves their well-being, especially among those who are chronically ill, because they can communicate, just by ticking a box, small, daily changes in their quality of life. “We’re trying to give kids a voice,” says Young. “But one of the major challenges has been getting people to recognize the role that children really play, the expertise they bring to the table.” ❏





BALZ KAMBER LEADS THE TEAM THAT WORKS IN LAURENTIAN'S TRACE ELEMENT FACILITY.

Finding platinum where there was once only nickel, CFI funding helps Laurentian's trace element facility purchase new laser system.

By Laura E. Young

Higher, faster, stronger – these are words commonly used to describe Olympic-level athletes. But researchers in Laurentian University's trace element facility are talking in similar upbeat terms about a new machine and its potential to help the mining industry.

In December 2009, Balz Kamber, (pictured above), a professor of Earth sciences and Laurentian's Tier 1 Canada Research Chair in Precambrian geology, and research scientist Thomas Ulrich, received CFI funding of \$170,900 toward the purchase of an ultra-violet laser ablation system for the Trace Element Mapping Facility for Geological Samples.

Trace element mapping produces two-dimensional maps showing the distribution of low-concentration elements of any material – in this case, minerals and fossils. The process is known informally as chemical fingerprinting. The maps produced give unprecedented insight into the conditions of mineral and fossil formation. As the precision and accuracy of trace element analysis improves, so, too, does the ability to reconstruct and understand the evolution of life on Earth.

The work being done in Laurentian's trace element facility has already garnered international recognition. Ulrich won the inaugural New Wave Research Laser Ablation prize for novel research into the science of laser ablation spectrometry at the Winter Plasma Conference in January. Ulrich and Kamber, and their colleagues Pedro Jugo and Doug Tinkham, published a paper explaining trace element imaging in the October 2009 edition of *The Canadian Mineralogist*, the journal of the Mineralogical Association of Canada.


Now, as they await the machine's arrival, Kamber and Ulrich speak glowingly of the ultra-violet laser. It is expected to produce better, cleaner data, faster than before. Their current laser is almost at the end of its service. Last year, the laser was down for six weeks for repairs. The new machine, they say, will be inexhaustible.

Additionally, the system will have a larger sample holder, thereby allowing for more sampling. Since the machine can work overnight, there will be no more waiting around in the lab while tests are running. "We don't even have to switch the machine off anymore," Kamber says.

The machine's capabilities will benefit the mining industry. Enhanced resolution means smaller elements can be located, Kamber says. "It's particularly useful for platinum group element research, which is very relevant to Sudbury. If you have a lot of nickel ore you can have some platinum that will not be homogenous in that lump of nickel. Platinum will show up as tiny, tiny nuggets. We can visualize those. The higher the resolution, the smaller the nugget we can find."

Ulrich adds: "If we can show these platinum nuggets occur, there will be benefits in finding and processing them."

"It will help those mining companies [who may be] throwing away the platinum," Kamber says.

Kamber and Ulrich believe the new laser system will benefit some key players, including academics from across North America, mining companies such as Vale Inco, the Canadian and Ontario geological surveys, and De Beers. They expect the machine to be operational by early summer 2010. 

As the precision and accuracy of trace element analysis improves, so, too, does the ability to reconstruct and understand the evolution of life on Earth.

Mining competitive and innovative solutions

By Laura E. Young

Laurentian's Productivity Enhancement and Risk Management (PERM) program is working to keep Ontario competitive in the global mining industry through research, development, and knowledge transfer. In 2007, PERM was launched as a \$24-million, five-year project. The collaborative research project is funded through industry, various institutions, and the Ontario Research Fund in the Ontario government's Ministry of Research and Innovation.

"The five-year funding from the Ontario Ministry of Research and Innovation has allowed us to take research ideas and provide the global mining industry with new ways of doing business," says Stephen Hall, president and CEO of MIRARCO (Mining Innovation Rehabilitation and Applied Research Corporation), which manages PERM on Laurentian's behalf.

Hall says that PERM is the largest research grant secured by Laurentian. "This taxpayers' investment in research is benefitting Ontario, improving the environment, and making jobs safer and more secure," says Hall.

There are three main research areas of expertise for PERM projects: 1) Design and Construction of Underground Excavations; 2) Integrated Planning, Design, and Optimization; and 3) Environmental Risk Management. Some highlights of the work to date include:


MINE PLANNING: PERM has developed mine planning software for companies in Australia. This specialty software helps mining companies predict the most advantageous ways to get the rock out of the ground.

EMPLOYMENT: The PERM project has funded over 150 person years of students, from the undergrad to PhD level, in the fields of chemical engineering, geology, computer sciences, Earth sciences, IT, and biology; and welcomed two visiting scholars from China in 2009.

CROP PRODUCTION ON MINE WASTE: Under Natural Resources Canada's Green Mines-Green Energy program, and with PERM funding, MIRARCO has been growing canola, corn, and switchgrass using wood production byproducts on old mine tailings sites. First and foremost, this is a strategy to rehabilitate mine properties; it may also eventually provide product for the global biofuel industry.

EXPORTING EXPERTISE: In 2008, biology professors Peter Beckett and Graeme Spiers spent two weeks in Russia lecturing on the Sudbury model of ecosystem remediation as part of a scientific research collaboration with Moscow State University and Research Institutes of the Russian Academy of Sciences.

"We are already getting excited by what we might achieve together with our multiple provincial, national, and international partners with a successful bid for a further five years" says Stephen Hall. Later this year, MIRARCO will submit another five-year funding proposal to the Ontario Research Excellence Fund in order to continue PERM's research. Along with other projects, MIRARCO plans to broaden the PERM portfolio of environmental projects. "We're looking to put more effort into our environmental activities, including energy efficiency and the carbon footprint of the industry to secure the future of mining in Ontario," Hall says.

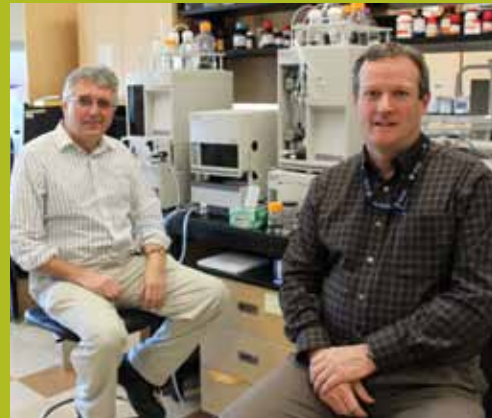
For further information visit: www.mirarco.org 

SAM SMITH IS A MASTER'S STUDENT AND A MEMBER OF MIRARCO'S CREW WORKING ON THE GREEN MINES-GREEN ENERGY PROJECT WITH NATURAL RESOURCES CANADA. THEY ARE TURNING MINE TAILINGS SITES INTO CORN FIELDS AND POTENTIAL BIOFUELS.

Green algae

GREEN ECONOMY

Laurentian researchers receive \$250,000 from MITACS to use mine sites as algae incubators to produce green energy and pharmaceuticals.



ENGINEERING'S JOHN ASHLEY SCOTT (LEFT) AND GREG ROSS (RIGHT) OF THE NORTHERN ONTARIO SCHOOL OF MEDICINE HAVE ALREADY STARTED BREWING THE ALGAE (FAR RIGHT) AND HIRED STUDENTS TO ASSIST IN THE RESEARCH AND DEVELOPMENT.

By Laura E. Young

What's not to like about green algae? Also known as microalgae, they produce oxygen and absorb carbon dioxide. They are nutritional. Visible only under a microscope, many microalgae are beautiful, like delicate green snowflakes tumbling across the glass of a laboratory slide.

Microalgae are literally blooming for Laurentian researchers John Ashley Scott, a professor of biochemical engineering, and Greg Ross, associate dean of research at the Northern Ontario School of Medicine (NOSM). They have been awarded a \$250,000 grant from MITACS, a Canadian research network, to look at mining sites as incubators for green energy and other value-added products. This collaboration between the schools of engineering and medicine will seek ways to produce carbon-neutral fuels and develop pharmaceuticals from microalgae grown on marginal mining land.

MITACS awarded the funding in November 2009. MITACS links business, government, and not-for-profit companies with over 50 Canadian universities. They collaborate to develop cutting-edge tools to bolster Canada's knowledge-based economy. The funding covers the hiring of approximately seven interns over two years. On this project, MITACS and Laurentian researchers are partnered with Al Insulation Systems, a British oil and gas company, and with Sussex Research out of Ottawa, a speciality chemical company. Xstrata Mining is providing land and other resources in Falconbridge, near Sudbury.

Laurentian engineering graduate students will help develop an algae farm on mining lands. "Our goal is to have a pilot plant this coming summer," says Scott. This exploratory work would then become a model for building an algae farm on another mine site, producing carbon-neutral fuels for the biofuel industry.

Once a microalgae farm is operational – and the right kind of algae is blooming – the biomass is harvested. Oil is extracted from the rest of the algae through either chemical, crushing, or ultrasonic methods. This sustainable solution could potentially provide fuel for the mining industry and help reduce diesel emissions underground. In addition to oil and pharmaceutical products, Scott says they will find uses for the entire crop.

In its labs, NOSM will identify potential pharmaceutical products that could then be processed at a large site near the source. Ross says that Sussex Research could help with the analytical work and commercialization.

This research is another example of how Laurentian and its partners are working to provide northern expertise for a global problem. "You could give us a different set of conditions, a different location, and we'll know how you can adjust to it. It would be designed not just for the mine site, but conditions," Scott says.

For Scott, the project is already sustainable in its approach, having secured suitable land that will not detract from land used for tourism, forestry, housing, or farming, he says. Mine sites offer "land that could be doing something constructive."

Meanwhile, over at the NOSM labs, grad students will be analyzing green algae for its potential to develop value-added pharmaceuticals and nutritional products, such as key Omega-3 fatty acids, and other chemicals. For Ross, this project matches the school's social accountability mandate because the work could provide future jobs. "We must not forget that employment is [one aspect] a community needs in order to stay healthy," he says. ◀

By Laura E. Young

PICASSO is run through Laurentian-affiliated SNOLAB, and Laurentian researchers and students play a key role in the collaboration. Now, the race to find an invisible particle has stepped up, and a Nobel Prize hovers on the horizon.

The search for dark matter is the hottest, yet most cordial, of international battles – pitting physicists against physicists. Various experiments searching for dark matter – each with its own different, somewhat cryptic, name – involve projects in Canada, France, Germany, Italy, Portugal, the United States, and the United Kingdom. PICASSO's role in the race to find dark matter is happening underground in SNOLAB, a lab built within Sudbury's Creighton Mine. Every day, the warm-up begins with the long descent into the mine. Descending in the cage, the overwhelming feeling is awe over the fact that fundamental science is conducted here. Dim, dusty, and surreal, the main corridors of Creighton Mine wind in a steady march toward SNOLAB. The journey two kilometers underground leads to an assortment of detectors, including detectors for the PICASSO experiment.

2006 at Laurentian University, where he teaches physics. "You have thousands of crickets and bugs flying around. If you go underground, you don't have the interference. It'll be easier to spot," says Wichoski. Wichoski, the lanky physics professor with a knack for explaining complex science, has worked with PICASSO since 2003, first in Montreal and now at Laurentian. Jacques Farine, another Laurentian physics professor, also oversees the project.

Detecting dark matter will be *the* story in particle physics and cosmology. The group that discovers dark matter first could win a Nobel Prize, says Wichoski. Of course, discovery is one thing, confirmation is another, he says. Finding dark matter will give all the other groups a focus point for further exploration. "Once dark matter is discovered, it will open a new chapter of physics and a new window to the universe," he adds.

In 2009, the International Year of Astronomy, PICASSO took an important step toward discovering dark matter. Groups of physicists watched with bated breath when the team shared its data at the prestigious international conference on

A shot in the dark



MEMBERS OF LAURENTIAN'S TEAM WORKING ON THE DARK MATTER QUESTION INCLUDE: (FROM LEFT) ANTHONY KARAGIORGAKIS, GRAHAM GIBSON, MAFANYIYA BELESHI, BRENT CARSCADDEN, JACQUES FARINE, UBI WICHOSKI, AND (FRONT LEFT) LUCIEN GATIÉN AND GREG CULY.

Inside, the lab is reminiscent of a massive submarine: There are many rooms, with ladders connecting levels. Metres of pipe snake through the corridors. Operating labs are cramped, with some areas restricted. At sea, submariners seldom showered, especially in the old days. But in SNOLAB, cleanliness is next to scientific discovery. To gain entrance to the lab, a thorough shower is required, sluicing off earthly particles in order to contemplate the universe. After showering, everyone dons the same uniform, with mining boots and a hairnet as accessories.

SNOLAB's underground location was strategic: The massive rock of the Canadian Shield literally shields the lab, minimizing the background noise and particles from the world above. "Think about a very hot summer night. You're trying to find a special, rare bug," says Ubi Wichoski, who formed the PICASSO group in

"Topics in Astroparticle and Underground Physics." PICASSO detectors showed the greatest sensitivity in tracking dark matter interaction. The findings were based on data obtained from 2 of the 32 detectors. They did not discover the particle itself, but they lowered the sensitivity limits, or scale, of the detectors, bringing them closer to the threshold they think particle interaction will occur. In essence, their search is now in the right vicinity.

Since the 1930s, astronomers have collected evidence of dark matter. According to Wichoski, "We have to explain the evidence. To have clusters of galaxies, all the clusters you see in the universe, ordinary matter is not enough of an explanation. There wouldn't be enough gravitational pull to create these structures," he says. ◀

RESEARCH ACTIVITIES

By Patrice Sawyer

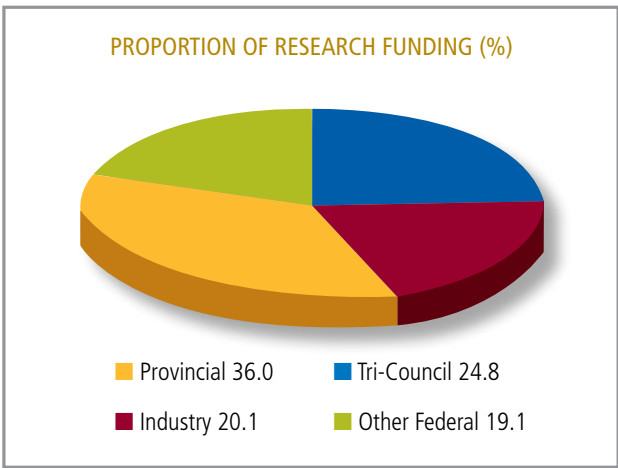
Soon, Laurentian University will celebrate its 50th birthday. There will be many things to celebrate on that day, and not least of them, the coming of age of Laurentian as a research institution. We offer six PhD programs and over 20 master's degrees. In 2003, Laurentian University introduced its first PhD program. Following that, in 2008, Ryan Mailloux (biomolecular sciences) received the first earned doctorate from Laurentian. Today, we count a total of 10 PhD graduates from the six doctoral programs that we currently offer. This is only one of the many ways that Laurentian shows its maturity in research, development, and creativity.

We rank sixth in Canada in terms of research growth, according to the most recent data available from Research Infosource. We are northern Ontario's research and science hub with notable expertise in areas such as the environment, mining, and health. From securing \$9 million in 2003 to close to \$20 million in 2008, Laurentian has come a long way. Our faculty members continue to succeed in obtaining highly competitive research funding. Often, the main beneficiaries of this funding are our graduate students who start as "researchers in training" and quickly become valued collaborators.

In Laurentian's strategic research plan, Laurentian University identifies five

key areas of strength and interest, and we shine a light on each area in this issue of *The Key*. Dr. Balz Kamber has been awarded a CFI grant of \$170,900 for his research in mineral exploration. When you come to the Sudbury campus, it is impossible to miss the Vale Inco Living with Lakes Centre, which is now under construction, and when complete in a few months, will be a premier centre for research in monitoring freshwater

lakes. Dr. Diana Coholic does research in social work that will improve the lives of children in our communities, and has applications far beyond. Laurentian's Canada Research Chair in Rural and Northern Health, Dr. Nancy Young, wants to ensure that rural and northern children will not be forgotten in research involving their own health and well-being. Diving into these pages, you learn the secrets of dark matter in the SNO laboratory, which is conducting internationally renowned research 2 kilometres underground.



These activities and projects are possible through the many organizations and funding bodies that support leading-edge research at Laurentian University. We are pleased to acknowledge all the agencies and contributors (governmental agencies, foundations, and industry). We are proud that they have invested in our researchers – it is always a worthwhile investment. ◀▶