

# Clayton H. Riddell

Faculty of Environment, Earth, and Resources

NEWSLETTER

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## Faces of Excellence.

Over the last few months, the Riddell Faculty has enjoyed the successes and recognition of our faculty and students. In this issue of the newsletter we cover the many awards, honours, and achievements conferred upon our unique community of scholars and researchers. The great diversity of projects reveals international as well as Canadian and Prairie interests. The recognition of Geological Sciences centenary celebrates the foundation of new innovations such as the development of a new, cutting-edge laser laboratory. Undergraduate and graduate students are actively participating in research, achieving extraordinary success, and gaining widespread attention and support for their work and studies.

By bringing together all these interests and activities, the Riddell Faculty provides interdisciplinary and integrated approaches to understanding the environment, the Earth, and its resources. In the near future, the fifth floor of the Wallace Building will be complete and we will welcome yet more colleagues (including new faculty and the Canada Excellence Research Chair, Dr. Søren Rysgaard) as well as students. The many faces of our Faculty truly represent the distinct role of humanity in addressing the challenges that living on Planet Earth offers. It is only through viewing the Earth from many perspectives that we can understand how we interact with our environment and resources. The many stories presented in this issue of the newsletter reveal how such integration is a proven approach to living on Planet Earth.



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## IN THIS ISSUE

Geological Sciences.  
Celebrating the Department's centenary

Research Projects.  
Looking at forests, climate, people, rivers, and lakes

Our Students.  
Stories of our students' successes, recognition, and research

New Facilities.  
Cutting-edge laser ablation laboratory reveals vital details

# In the News.

**Dr. Vaclav Smil** (Distinguished Professor, Department of Environment and Geography, F.R.S.C.) received significant attention in the media (Globe and Mail, Winnipeg Free Press) in July as a result of Bill Gates listing a number of his books on his web site. Gates declares *"he has opened my eyes to new ways to think about solving our energy and environmental issues"*. Dr. Smil will have four books published in 2010 alone; among them the book *"Energy Myths and Realities: Bringing Science to the Energy Policy Debate"* (American Enterprise Institute) was released in July, followed by *"Prime Movers of Globalization: The History of Diesel Engines and Gas Turbines"* (MIT Press) in September.



**John Iacozza** (Instructor, Department of Environment and Geography, and Ph.D. student) gave numerous media interviews (CBC, CTV, Global, Aboriginal Peoples Television Network) following the sighting of a polar bear in Shamattawa, a small northeastern community in Manitoba in August. This is significantly south of where polar bears are normally found. *"They might be travelling down, further south to look for food or to get away from bigger bears"*, he explained. (Pictured left.)

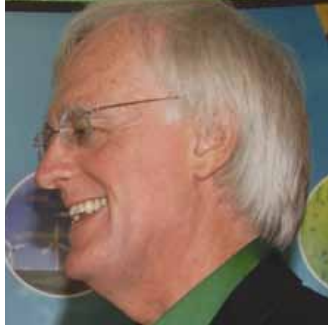
**Dr. Greg McCullough** (Centre for Earth Observation Science) was interviewed in August (Winnipeg Free Press) regarding

the growth of blue-green algae in Lake Winnipeg and its toxic effects. Dr. McCullough uses satellite imagery to track the algae growth and notes that the toxins produced largely affect dogs and cattle.

**Nick Laporte** (Master of Natural Resource Management (MNRM) Student, Natural Resources Institute) was interviewed about his research on the Western Grebe (Daily Graphic, Central Plains Herald Leader). He and his advisor **Dr. Nicola Koper** found a 40-year old study of the birds in Delta Marsh on which to base his work. The Western Grebe is best known for its elaborate and charismatic courting rituals.

**Dr. Gary Stern** (Department of Fisheries and Oceans Chair, Centre for Earth Observation Science) was interviewed regarding the levels of contaminants in fish in the McKenzie River (Globe and Mail). Levels of PCBs, DDT, and mercury are rising due to increasing temperatures in the Arctic making these pollutants more biologically available.

**Dr. Alexis Knispel** (Recent Ph.D. Graduate, Department of Environment and Geography) was interviewed regarding her research on Roundup resistant canola (New York Times). The proliferation of canola in fields has in some cases led farmers to plough their fields to control weeds that may contribute to soil erosion.



**Dr. Ronald Stewart** (Head, Department of Environment and Geography, F.R.S.C.) was inducted as a Fellow of the Canadian Meteorological and Oceanographic Society (CMOS) at the annual conference in Ottawa in June 2010. CMOS is the main scientific organization in Canada for the atmospheric and oceanographic sciences and has approximately 1000 members. Dr. Stewart was recognized *"for his long-standing service to the meteorological community in teaching and research and for his outstanding organizational and scientific leadership at both national and international levels"*.

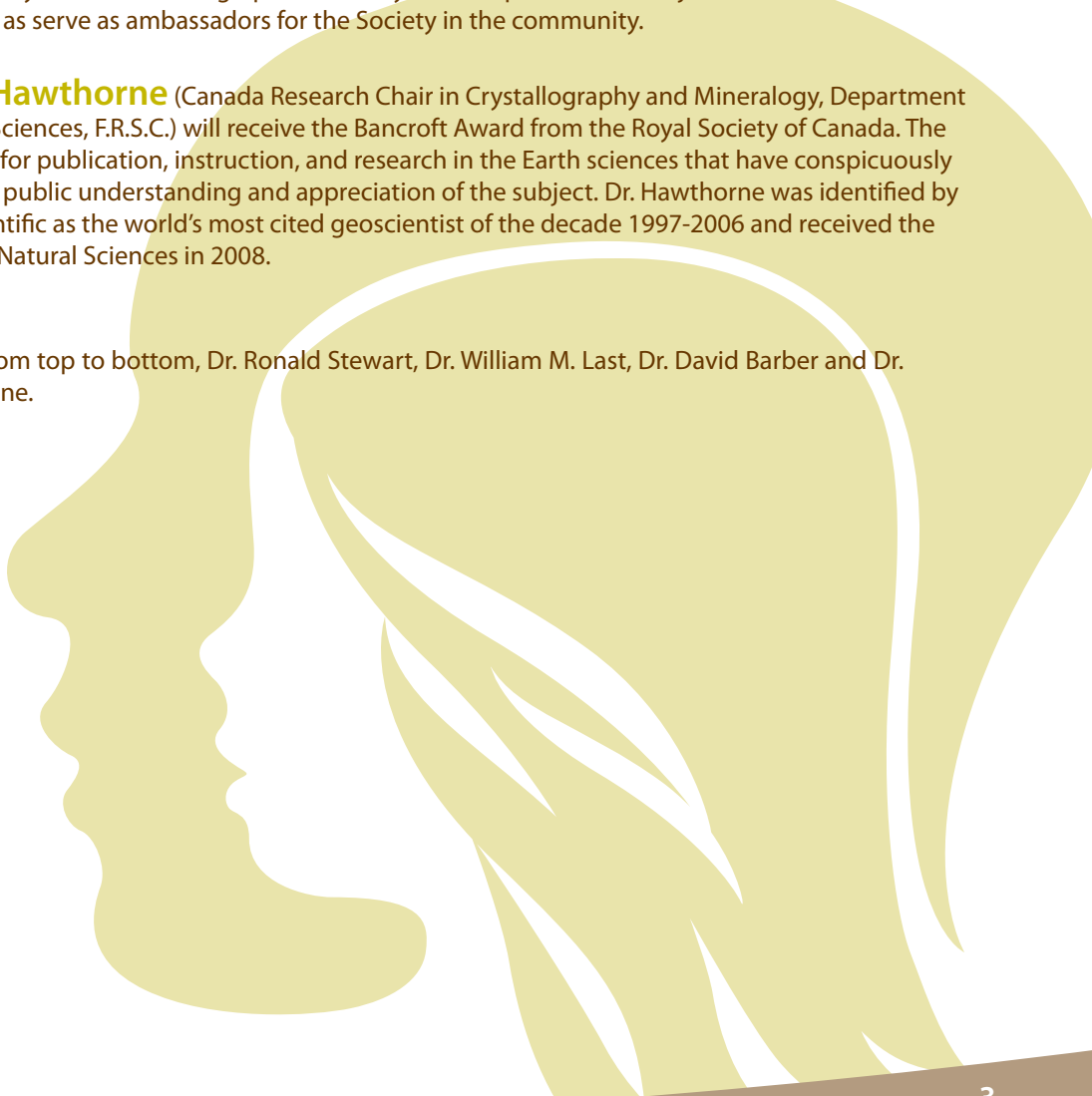
**Dr. William M. Last** (Department of Geological Sciences) is the inaugural recipient of the Israel C. Russell award of the Limnogeology Division of the Geological Society of America. The Israel C. Russell Award recognizes major achievements in Limnogeology through contributions in research, teaching, and service. See **page 13** of this newsletter to read about his work in Manito Lake, Saskatchewan.

**Dr. David Barber** (Canada Research Chair in Arctic Systems Science, Department of Environment and Geography, and Director, Centre for Earth Observation Science) will be inducted into the College of Fellows of the Royal Canadian Geographical Society. Fellows promote the objectives and interests of the Society as well as serve as ambassadors for the Society in the community.

**Dr. Frank Hawthorne** (Canada Research Chair in Crystallography and Mineralogy, Department of Geological Sciences, F.R.S.C.) will receive the Bancroft Award from the Royal Society of Canada. The award is given for publication, instruction, and research in the Earth sciences that have conspicuously contributed to public understanding and appreciation of the subject. Dr. Hawthorne was identified by Thomson Scientific as the world's most cited geoscientist of the decade 1997-2006 and received the Killam Prize in Natural Sciences in 2008.

Pictured left from top to bottom, Dr. Ronald Stewart, Dr. William M. Last, Dr. David Barber and Dr. Frank Hawthorne.

# Faculty Awards.





# Student Awards.

**Jill Maxwell** (Undergraduate Student, Geological Sciences) won the award for the best student presentation at the Society for Environmental Geology and Health 2010 conference in Galway, Ireland. She was the only undergraduate student presenting and won the award against competition from M.Sc. and Ph.D. students. Her paper *“Remediation of arsenic contamination by a natural wetland at New Britannia Mine, Snow Lake”* was co-authored with **Dr. Barbara L. Sherriff** and Dr. Elena Khozhina (a former research associate of Dr. Sherriff).

**Kate Turner** (Master of Natural Resource Management Student (MNRM), Natural Resources Institute) won the ISE Student/Recent Graduate Prize for the best poster at the International Society of Ethnobiology conference, Tofino, BC, in May 2010. Her poster, *“Supporting Cultural Practices Through Business? Gitga’at First Nation Perspectives on Locally-Driven Cultural Tourism Development”*, was based on her thesis that

she defended in July 2010. This is Kate’s second major poster win. The first was at a national-level meeting, the Oceans Management Research Network (OMRN) Conference in Ottawa in October 2009.

**Matthew Asplin** (Ph.D. student, Environment and Geography) is the recipient of a \$40,000 Garfield Weston Award for Northern Research. The award is conferred by the Association of Canadian Universities for Northern Studies (ACUNS) which promotes the advancement of northern scholarship. He is investigating the role of Arctic storms upon sea ice motion, and the rates of thermodynamic sea ice growth and decay. The declining Arctic sea ice cover may be more susceptible to influences from Arctic storms. During the winter, storms can force areas of relatively thin sea ice to fracture, forming open water features known as sea ice leads. Matthew’s work will also examine how a shift from a multi-year sea ice regime to a seasonally ice-free regime may affect Arctic storm frequencies and intensities.



# Governor General’s Silver Medal.

Alison Murata, graduating with a Bachelor of Environmental Science (Honours Co-op) Degree, was awarded the Governor General’s Silver Medal on October 21, 2010 at the 43rd Fall Convocation.

While Alison is thrilled to be graduating, she is also excited to embark on the next journey of her academic career. While her first co-op work term placement sparked her interest in the field of Soil Science, this spark quickly grew into a passion during her second co-op placement. *“Co-op was really helpful as it allowed me to focus on research.”* A NSERC Summer undergraduate student research award allowed Alison to gain additional research experience. So it comes as no surprise that Alison has been accepted into a Master’s program in Soil Science at the University of Manitoba. Notably, she is also the recipient of a Graduate NSERC Award. The Riddell Faculty is very proud of Alison’s achievement and wishes her all the best in her further studies.

The Governor General’s Silver Academic Medal is awarded annually on behalf of and in the name of the Governor General of Canada to the University of Manitoba graduate with the highest academic standing in a baccalaureate program, and is one of the most prestigious awards an undergraduate degree student in a Canadian post-secondary institution can receive.

Pictured left to right, Dr. Chaosheng Zhang with Jill Maxwell, Kate Turner, Matthew Asplin and Alison Murata with Dr. Norman Halden (Dean, Clayton H. Riddell Faculty of Environment, Earth, and Resources).

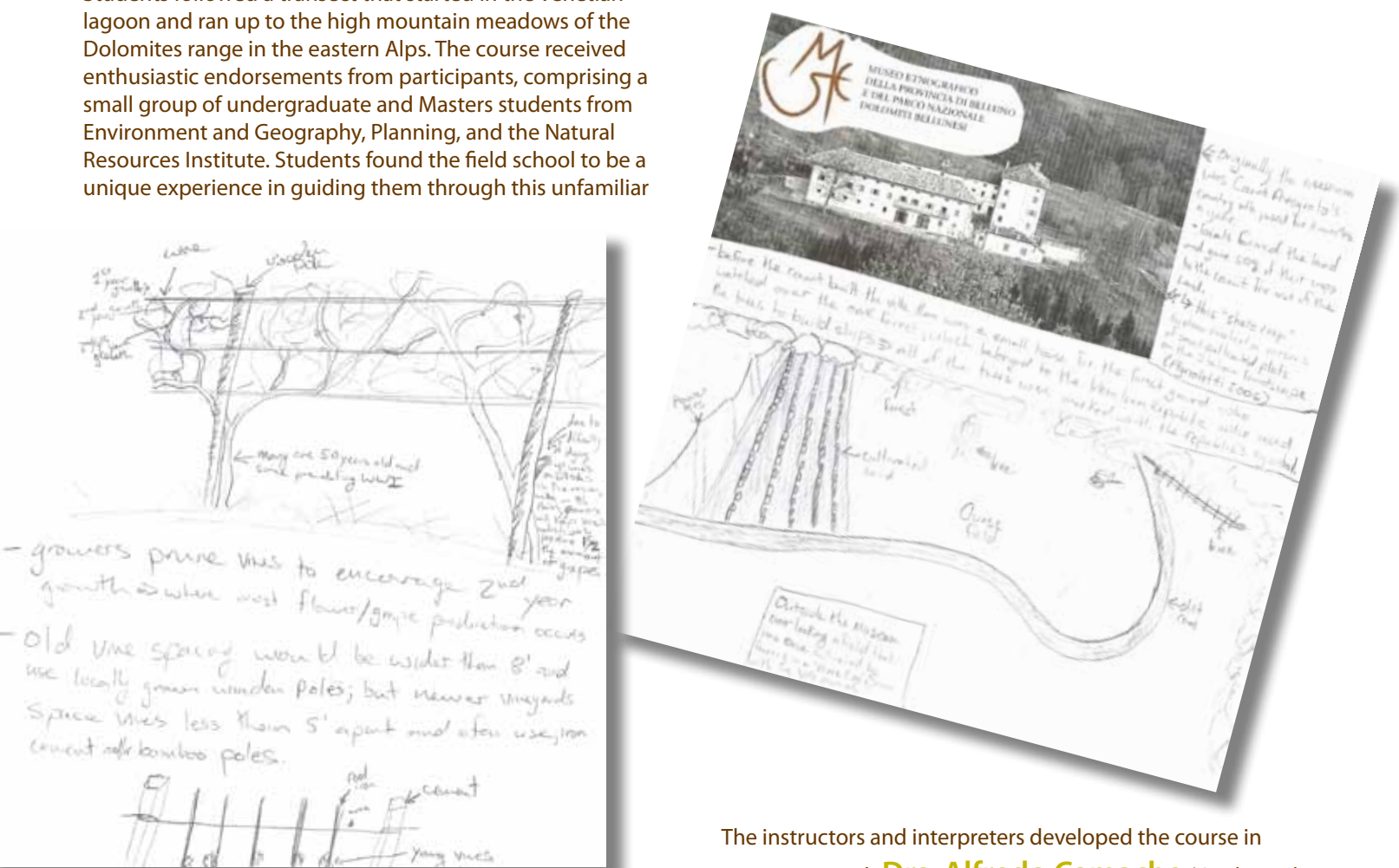




# Cultural Landscapes Italian Field School.

A new and innovative course, the Cultural Landscapes Italian Field School, took place in May 2010. Led by **Dr. Bonnie Hallman** and **Dr. Iain Davidson-Hunt**, and two interpreters (graduate students **Catie Burlando** and **Nathan Deutsch**, Ph.D. students at the Natural Resources Institute) the course ran for two weeks in northeastern Italy. Students followed a transect that started in the Venetian lagoon and ran up to the high mountain meadows of the Dolomites range in the eastern Alps. The course received enthusiastic endorsements from participants, comprising a small group of undergraduate and Masters students from Environment and Geography, Planning, and the Natural Resources Institute. Students found the field school to be a unique experience in guiding them through this unfamiliar

of local experts—One observed *“Actively engaging local people in an effort to understand why things are the way they are, and how they compare to our own experience in Canada was very unique, educational and enjoyable.”* Students received three credit hours for submitting a journal detailing their observations and experiences, and for graduate students, for delivering researched ‘field talks’ on chosen themes.



landscape. *“I consider myself to be well traveled but this course definitely opened me up to a new world still”,* one student explained. *“I would have never had [these] learning opportunities otherwise ... It is one thing to discuss a landscape and completely different to visit and experience it.”*

The course was developed to introduce students to the study of cultural landscapes through immersion in an unfamiliar environment. Students appreciated the frequent involvement

The instructors and interpreters developed the course in association with **Drs. Alfredo Camacho** (Geological Sciences) **Ted McLachan** (Landscape Architecture) and **Mary Benbow** (Environment and Geography). Support was provided by **Dean Norman Halden**, the Clayton H. Riddell Faculty of Environment, Earth, and Resources Endowment Fund, and by **Dr. Bill Kopps**, Director, Extended Education for its development and offering in 2010. The development of this course has created an exciting new template for future field schools offered through the Faculty—keep watching for future offerings.

# Climatic Variability, Social-Ecological Changes and Dengue Research in Bangladesh.

**Dr. Emdad Haque** (Director, Natural Resources Institute, pictured below far right), **Dr. G.U. Ahsan** (Head, Department of Public Health, North South University, Bangladesh), **Dr. Michael Drebot** (Chief, Viral Zoonoses and Director, Science Technology and Core Services, National Microbiology Laboratory, Public Health Agency of Canada, Winnipeg), and **Dr. Abdullah Brooks** (Head, Infectious Diseases Unit, International Centre for Diarrhoeal Disease Research, Bangladesh) are leading research to advance knowledge and practice regarding the prevention and control of dengue disease in Bangladesh. According to the World Health Organization, the occurrence of

dengue around the world has increased dramatically in recent decades with two fifths of the world's population at risk. Dengue is a mosquito-borne infection for which there is no vaccine; consequently, management and prevention relies upon controlling the vector mosquitoes. The study, comprised of four components, will determine the prevalence of the dengue virus and disease vectors in order to explain the presence of the disease. In addition, it will examine the effects of climate, local social and ecological factors, and human behaviour on disease vector densities. Lastly, the study aims to enhance the capacity of local communities to involve public participation and policy development. This collaborative research will link

researchers and graduate students from the Natural Resources Institute (Dr. Emdad Haque), Department of Anthropology (Dr. Stacie Burke), Department of Medicine (Dr. Ethan Rubinstein), Department of Medical Microbiology (Dr. Harvey Artsob), and the Public Health Agency of Canada (Dr. Michael Drebot and Dr. Robbin Lindsay). Two NRI Ph.D. students (**Parnali Dhar Chowdhury** and **Sabrina Islam**) are also working in this project. This initiative was launched on May 23, 2010, at an international symposium on dengue and dengue hemorrhagic fever in tropical countries, at North South University, Dhaka, Bangladesh.





# Geological Sciences Centenary Celebrations.

The Department of Geological Sciences has celebrated its centenary with a number of events. Around 120 alumni, guests, staff, and students attended the evening events of the Centenary weekend, August 27-29, 2010. The weekend included a lively evening *"beer and bull"* reunion at University Centre, and a more formal celebration in the Ed Leith Cretaceous Menagerie in the Wallace Building. **Dr. Ian Ferguson** (Department Head) acted as emcee for the evening and a number of faculty offered congratulations, summarized centenary events and projects, and

recounted the colourful history of the Department. The Department wishes to acknowledge the generous support from alumni, friends, industry, and associations for our centenary projects, the History Wall and the Mosaic Map of Manitoba Geology. The History Wall was unveiled on August 28, and the design and building of the Mosaic Map of Manitoba Geology is underway with an anticipated completion early in 2011. A small but enthusiastic group visited the Department's Star Lake Field Station (northwestern Ontario) on Sunday, concluding with a traditional group photo on the deck of the student bunkhouse. (Pictured Right)



The Department also welcomed two noteworthy scientists to the University of Manitoba for talks, student discussions, and social events through the Jack Gallagher Visiting Scientists Endowment. MaryAnn Mihychuk visited in March and Alan Green in September. Ms. Mihychuk, a practicing geoscientist with 30 years of experience in the mineral sector, served as the Minister of Mines for Manitoba and as Manitoba's Trade Minister. In her public lecture, she discussed the politics of geology and the public perception of the mining industry, while her technical talk focused on the realities facing geoscientists with regard to regulations and licensing and how industry is coping.

Dr. Green, an internationally recognized geophysicist, is Professor of Applied, Engineering, and Environmental Geophysics at ETH (Swiss Federal Institute of Technology). His public lecture focused on how environmental and engineering geophysics is being applied to solve key problems, while in his technical talk, he highlighted the geophysical techniques that were used to map the New Zealand plate boundary. With the recent Canterbury Plains 7.0 earthquake, his talk provided a timely perspective on risk assessment.

Lastly, a special session was held at the GeoCanada 2010 Conference in Calgary, May 10-13, 2010 that focused on geological processes over time in central Canada. A special issue of the Canadian Journal of Earth Sciences is anticipated in 2011.

A special centenary newsletter for Geological Sciences Alumni will be released within the next 2-3 months.

Pictured Below: The History Wall is officially opened. From left: Mercedes Rich (undergraduate student), Jeff Young (Instructor, alumnus), Brenda Miller (Department History Committee Chair and staff member), Bill Brisbin (Emeritus Professor and member, Department History Committee), David Richardson (alumnus, class of '46)



Pictured Left:  
Opening remarks:  
Ian Ferguson  
addresses guests,  
Saturday, August  
28, Cretaceous  
Menagerie of the  
Wallace Building





# Beating a Dead Horse Creek.

The status and integrity of Lake Winnipeg has been an issue for Manitobans for more than a generation and especially now, with algal blooms and poor water quality attracting national attention. Excess nutrients and contaminants from numerous sources can all contribute to the decline in the lake's health. Municipal wastewater effluents from rural communities are an important, yet under-appreciated, source of loading in the lake's watershed. Environment Canada has created the Lake Winnipeg Basin Stewardship Fund to support research aimed at improving the ecological sustainability of the lake. In the most recent competition, a team of researchers including **Dr. Mark Hanson** (Environment and Geography), were awarded approximately \$150K from the fund to support a \$450K project to examine the potential for wastewater wetlands to significantly reduce wastewater nutrient and contaminant loadings to systems that feed into the lake. Dr. Hanson, working with Drs. Charles Wong and William Buhay (University of Winnipeg) and post-doctoral fellow **Jules Carlson** (University of Manitoba), will focus his lab's efforts on examining the roles of aquatic invertebrates and plants in

removing nutrients and contaminants in these systems. This research is in close collaboration with the communities of Morden and Winkler who currently release passively treated wastewater into the Dead Horse Creek at timed intervals from sewage lagoons. This waterway then flows into the Plum River and on to the Red River, taking any excess nutrients or contaminants on to Lake Winnipeg. The towns of Morden and Winkler are interested in the potential for adding wetland treatments to their current wastewater management plan. This research aims to develop recommendations for the communities to pursue this approach by assessing current nutrient and contaminant loadings, the ecological effects these stressors might be causing, and the mechanisms by which wetlands and their constituents can help remove the chemicals.

The Dead Horse Creek will be used as a model watershed for what is happening in the larger basin. The recommendations that will flow from the work will hopefully result in improved water quality throughout the basin and lake for future generations of Manitobans.

Pictured below: Environment and Geography M.Sc. student **Scott MacKenzie** sampling on the Dead Horse Creek downstream of the town of Winkler.



# Cheeyahwaysaag: Forests Returning to the Way Things Were.

The boreal forests of Canada are an ecological system where periodic catastrophic disturbances such as forest fires, spruce budworm, and beaver activity play important roles in shaping northern ecosystems. Together these disturbances facilitate nutrient cycling, initiate ecological succession, and help to shape the composition and structure of ecological communities. Increasingly, activities such as industrial logging are influencing landscapes, ecological processes, and human communities. **Andrew Miller** (Ph.D. student, Natural Resources Institute) has undertaken research, supported by the **Aboriginal Issues Press Scholarship**, to examine the traditional ecological knowledge of Anishinaabe elders of Pikangikum First Nation, northwestern Ontario concerning the social and ecological impacts of forest disturbances in their community.

Andrew asked the elders to share their understandings of the impacts of forest fire and forestry operations they observed. They noted that areas burned by forest fires quickly become highly productive, especially in plants favored by moose and snowshoe hare, but that clearcut areas tend to be ploughed and scarred and are therefore unproductive for years following timber harvests. Moose are favoured species for northern hunters and contribute to the household larder while hare, although at the bottom of the food chain, support not only people but are important fur-bearers. Elders also felt that the timber harvested lands are disrespected by the rough treatment of modern forestry practices that produce homogeneous plantations of pine. Wildlife find it inaccessible and snowshoe wearing hunters and trappers feel uncomfortable in an area where someone has destroyed natural forest and replaced it with a forest in their own image.

Pictured below: An area of forest recovers three years after a burn.





# New Laser Laboratory.

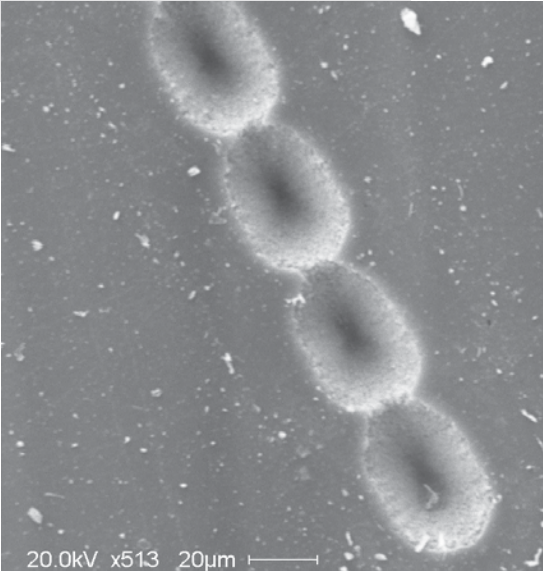
Laser Ablation Inductively-Coupled Plasma Mass spectrometry has been around as an analytical tool for around twenty years. The laser is used to ablate the material of interest in an enclosed sample cell where a “carrier gas” (usually a mixture of argon and helium) takes the sample to a mass spectrometer. The major advantages of the technique are that the samples taken are very small (on the order of a few microns) and that it is particularly sensitive, detecting trace elements down to the parts per billion (ppb) level. The combination of laser and mass spectrometer offers a forensic approach that characterizes the material and the environment where it came from. It is used to analyze everything from diamond indicator minerals to beluga teeth to fish ears.

The first lasers usually interacted with the sample unpredictably leading to uncontrolled ablation. Different materials still react uniquely, and during the ablation melting of the sample “fractionation” errors can occur where light and heavy elements behave in divergent ways, degrading the quality of the analysis.

The latest addition to the laser arsenal is the femtosecond laser producing laser pulse widths of ~ 40 femtosecond. This laser produces non-thermal ablation which radically reduces fractionation errors. In addition, from a practical perspective, this enables very fine-scale analyses of the distribution of volatile trace elements such as selenium and mercury, which are notoriously difficult to analyze. We hope to apply the technique shortly to the analysis of minerals in ice, which will be a true test of its non-thermal attributes.

Aside from all that science stuff if things get dull you can also generate your own laser light show. With sufficient power you can make “plasma balls” with femtosecond laser pulses. A simple lens in the beam path will focus the invisible, near infrared laser light to a point where white plasma is generated. The vibration of the air produces a high-pitched whine, and yes you can smell the ozone, but it actually has a practical purpose. As the laser is being adjusted in the femtosecond regime, the sound and the ozone smell is a tangible signal that the pulse width is approaching an optimum state.

The below image shows “laser ablation pits” in a sample. The inverted cone shape is actually an “image” of the focused laser beam in the sample. The material that used to be there was almost instantaneously converted to an atomized aerosol and carried to the mass spectrometer for measurement in an argon “carrier gas”. The NIR-fs laser is capable of taking particularly precise samples.



# “Living” Lake Rocks Record Prairie Cold.



The discovery of one of Earth's oldest life forms in a Saskatchewan lake has revealed evidence of a previously unrecorded Prairie cold snap. Microbialites found in Manito Lake, 100 km west of Battleford, Saskatchewan, are helping researchers in Geological Sciences decipher the past climate and hydrology of the northern Great Plains.

The geologically recent cold phase in western Canada, discovered by **Bill** and **Fawn Last**, started abruptly 2200 years ago and ended about 800 years ago. The evidence for this cold period is found in laminated microbialites, referred to as stromatolites. These cauliflower shaped rocks have a laminated interior, the same as stromatolites that date back to 3.4 billion years. They are formed layer upon layer by a combination of processes involving cyanobacteria and their interaction with the aqueous environment to form minerals. At some point about 2000 years ago a mineral formed in Manito Lake that is stable only at temperatures below freezing. This mineral, named ikaite, formed the core of the large microbialite mounds and reefs in Manito and is key to deciphering the past temperature regime of Prairie lakes over the past several millennia. Although this discovery is an important link in helping to better understand the natural variability of Prairie climates, the occurrence of this low temperature mineral associated with primitive life forms like cyanobacteria is critical in the search for life on Mars.

Pictured left top to bottom, Modern cyanobacterial mat from Manito Lake, Saskatchewan and Bill Last.



# Undergraduate Research Aboard the Amundsen.



A number of undergraduate students were awarded NSERC Undergraduate Student Research Awards (USRA), allowing them to participate in the 2010 Arctic cruise of Canada's research icebreaker, the CCGS Amundsen. This is the second year the undergraduates have assisted in research on the vessel, and some took the opportunity to make this part of their Cooperative Education Option. Overall, the students helped on many fronts, including: preparation of equipment for shipping, mobilization of the ship in Quebec City - the Amundsen's home port, field sampling and subsequent analysis of samples and data sets. The Centre for Earth Observation Science (CEOS) recruited and funded the students as part of the 2010 ArcticNet expedition. ArcticNet ([www.arcticnet.ulaval.ca](http://www.arcticnet.ulaval.ca)) is a Network of Centres of Excellence of Canada that brings together scientists, managers, northern communities, and the public and private sector to examine climate change in the coasts of Canada's Arctic.

*This unique field experience is, to quote Andrew, "nothing less than life changing".*

**Andrew Osipa** assisted in the construction of Ice Mass Balance Buoys (IMBB) that are used to measure temperature above, below, and within ice, changes in ice thickness, and location. By observing the ice mass balance and atmosphere-ice-ocean attributes, change in the Arctic Ocean can be more effectively monitored. On board the Amundsen Andrew also took water samples and made meteorological observations with fellow students. This unique field experience is, to quote Andrew, *"nothing less than life changing"*.

Pictured left from top to bottom, Andrew Osipa, David Babb, and David Capelle.

**David Babb**, who also worked on the IMBBs, developed a program to read ice beacon positions that can be used to determine the motion of sea ice. This can be used to determine cyclonic activity that has been shown to have increased in the Beaufort Sea. David took part in the inaugural Schools on Board Program back in 2004 and has now been accepted into the master of science program in the Department of Environment and Geography under the supervision of Dr. D. Barber.

*"how important it was for groups of researchers to share information and data with others".*

**David Capelle** prepared equipment for water sampling and data collection to examine freshwater transport in Hudson Bay. On board the Amundsen he collected samples, performed salinity analyses, and recorded meteorological observations. Effective interaction among researchers was evident to David who observed *"how important it was for groups of researchers to share information and data with others"*.

**Jeremy Barber** assisted in the analysis of Radarsat images which David Capelle processed using GIS software. He also participated in field research in Hudson Bay assisting Dr. Greg McCullough to collect data on the influence of freshwater from the Nelson River system on marine processes in Hudson Bay. This is a collaborative project with Manitoba Hydro.



**Chris Stammers** assisted in developing programs to read wind data in order to analyze Sudden Stratospheric Warming (SSW). SSW events are rapid shifts in upper atmospheric winds that are strongly influenced by surface contrasts, and are therefore of great interest for our changing Arctic.

**Alyssa Almojuela** and **Kaitlin Alexander** assisted with the Schools on Board program that included field program planning and preparation, creating promotional materials for Schools on Board, and correspondence with this year's participants in order to inform and update them on the program. Alyssa also traveled to Oslo to participate in the 2010 International Polar Year (IPY) Oslo Science Conference.

**Michelle Curry** was involved in a number of projects that involved the processing of all-sky images and Sea Ice Extent (SIE) imagery and the plotting of sea ice concentrations. She also participated in the journal club by critiquing recent research on storm frequencies and intensities in the Arctic. To quote Michelle, she has *"now realized that I want to pursue a career in research"*.

**Meredith Pind** prepared and maintained equipment to examine carbon fluxes and surface water carbon chemistry, and provided background information to new students through a seminar series. This was the second summer that Meredith has worked with CEOS, and she says that *"it has completely altered my life plan"*, and that *"After spending a summer up north on board the CCGS Amundsen I have fallen in love with fieldwork, the research associated with it, and the beauty of the Arctic"*.

These undergraduate students joined several other graduate students within CEOS in research designed to understand the impacts of climate change on the Arctic marine system of northern Canada.

Pictured left from top to bottom, Chris Stammers, Michelle Curry, and Meredith Pind.



## IMPORTANT DATES

### November 14-20

Geography Awareness  
Week (2010 Theme – Fresh-  
water)

### November 17

GIS Day

### December 5

World Soil Day

### December 11

International Mountain  
Day

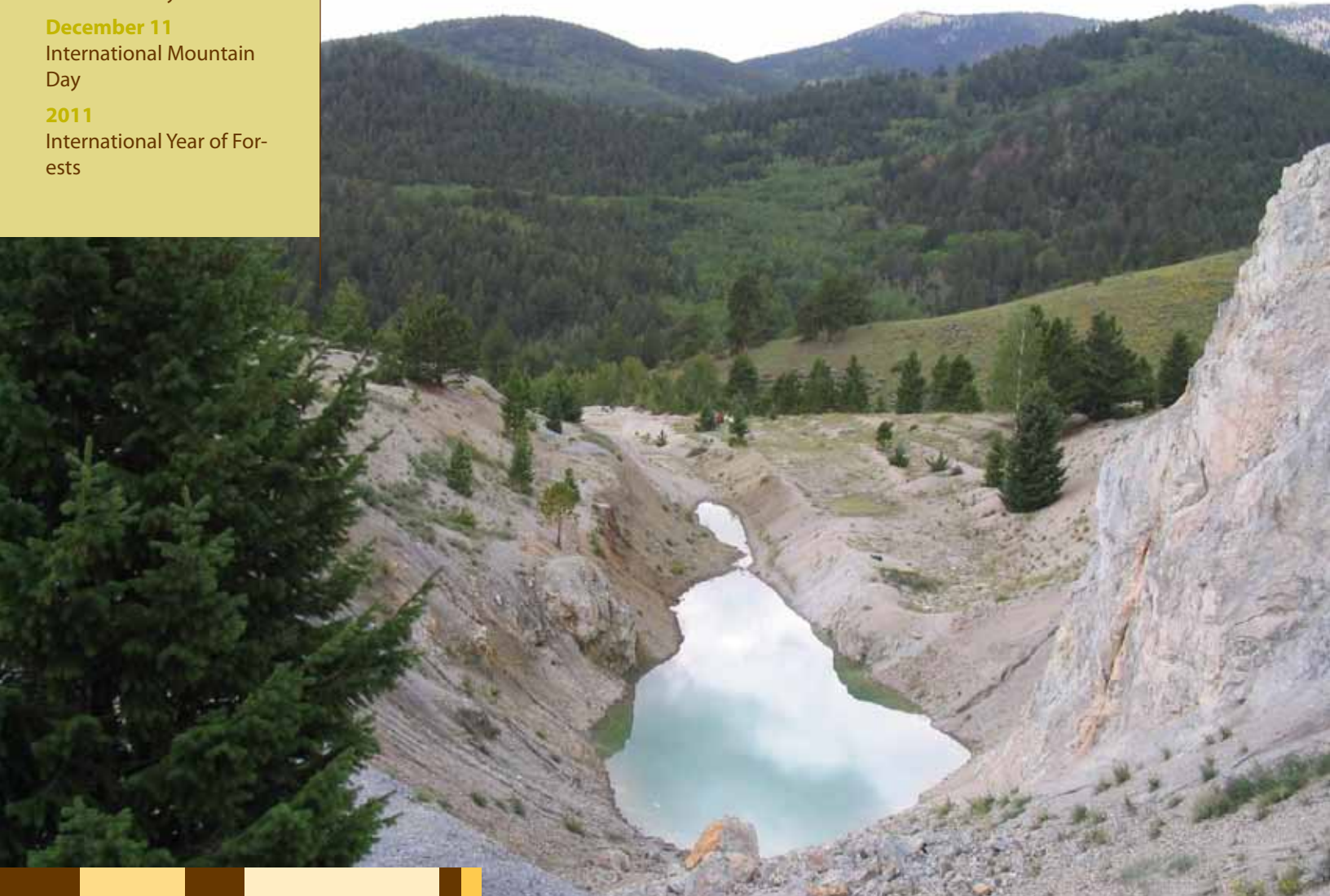
### 2011

International Year of For-  
ests

# Picturing the Planet.

As a regular feature **"Picturing the Planet"** will bring inspiring and informative images, taken by our students and faculty, to reflect on the beauty and diversity of our world. If you have taken a picture that expresses the majesty and beauty of our planet, consider submitting it plus a few words for the next issue of the newsletter.

The Hall mine located near Villa Grove, Colorado is a supergene copper deposit that has been mined for its copper and was also mined prehistorically for its semi-precious gem mineral turquoise,  $\text{CuAl}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 4(\text{H}_2\text{O})$ . Supergene deposits are formed when meteoric water (rain water) percolates downwards through a copper rich rock and concentrates copper rich minerals near the water table. The Hall mine is no longer operational and was flooded producing the blue-green lake in the center of the photograph. The blue-green color of the lake is due to the dissolved copper in the water.



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