

Elements



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LE BULLETIN DE L'UNION GÉOPHYSIQUE CANADIENNE

President's Column

I write this, my final CGU President's Column, with very mixed emotions for a number of reasons. First, I have tremendously enjoyed my term as President, but will, like all President's, be happy to turn over the responsibilities to others. On another positive note, we continue to make progress in both the revitalization of the sciences within Canada, and the strengthening of the CGU. There are numerous examples of the revitalization of the sciences in Canada, ranging from the opening of the Canadian Light Source at the University of Saskatchewan to the upcoming International Polar Year for example. Within our own Union we continue to make progress through enhancement of our interactions with other scientific societies in Canada. Further details are noted below.

Along with these positive changes, there have been numerous very sad events recently. Globally, we have witnessed the terrible losses caused by the tsunamis in the Indian Ocean. This event should be a reminder to all of us that human societies are, and always will be, prone to extreme catastrophic events. The recent events in Asia should be a reminder that rare, but truly catastrophic, events will occur, with great societal impacts. As geophysical scientists, we must remember that one of our major goals is to provide society with the knowledge and skills required to limit the tremendous costs in both life and property that these events take.

Closer to home, it is with great sadness that I inform you of the recent passing of Professor Donald Gray. Don was the recipient of the J. Tuzo Wilson Medal in 2000, and

due to his dedication to teaching, the Hydrology Section Best Student Paper award was named the "D. M. Gray Award" in his honour. Don made numerous contributions to the field of Hydrology in Canada, and his dedication to excellence, was an inspiration to all. He will be sadly missed. The Wilson medal nomination speech and his response is available at www.cgu-ugc.ca/medal/DMG_Wilson_Medal2000.html.

Below are additional details on some of the issues raised above.

International Polar Year 2007-2008:

As many of you may know, the international community is planning an International Polar Year (IPY) for the period 2007 – 2008. IPY 2007-08 will celebrate the 125th anniversary of the First International Polar Year (IPY), the 75th anniversary of the Second IPY and the 50th anniversary of the International Geophysical Year (IGY). The IPY 2007-2008 will be an intense, global campaign of coordinated polar observations and analysis, that will focus on both poles, and be both international and multidisciplinary in scope. Activities will be coordinated by the IPY Joint Committee established by the International Council for Science and the World Meteorological Organization. In Canada, we have a Canadian Secretariat, hosted at the University of Alberta, as well as a number of related working groups and commissions to coordinate Canada's IPY initiatives.

For those not familiar with IPY, further information can be obtained at www.ipy.org and www.ipy-api.ca. Although there has been a call for pre-proposals, there are continuing opportunities to become involved with IPY.

As a major geophysical scientific organization in Canada, many CGU members will provide critical leadership and scientific research to the IPY. As a result, we plan to organize a number of IPY related activities at our annual meeting in May. Further information will be provided on the CGU meeting web page.

Banff 2005:

I would like to remind you that planning is continuing for our upcoming meeting to be held in Banff between May 8-11, 2005. As in past years, the CGU will be presenting the following Student Awards:

CGU Best Student Paper Award (all fields of geophysics)
D.M. Gray Award for Best Student Paper in Hydrology
Chevron Canada Outstanding Student Paper in Seismology
Geodesy Award for Best Student Paper in Geodetic Research & Education.
Campbell Scientific Award for Best Student Poster in Hydrology
Shell Canada Best CGU Student Poster Award (other than hydrology)

Please remember that information on the critical deadlines for abstract submission, registration, and student awards will be available at www.cgu-ugc.ca. Please check for details as they become available.

In addition to these awards, CGU solicits nominations for the J. Tuzo Wilson Medal. The Union gives this award annually to recognize scientists who make outstanding contributions to Canadian geophysics. Factors taken into account in the selection process include excellence in scientific or technical research, instrument development, industrial applications and/or teaching. If you would like to nominate a candidate please contact CGU Awards Committee Chair. Details are available at: <http://www.cgu-ugc.ca/medal/intro.html>. See also the Call for Nominations in this newsletter.

For those of you who wish to look ahead. We plan to have our 2006 annual meeting in Banff, and we are currently finalizing arrangements for a joint meeting with CMOS in St. John's in 2007.

Affiliations with other Societies:

As part of our strategy to both improve the excellence in our sciences and to help overcome the impression that the geosciences are not relevant to Canadians, CGU continues to enhance our linkages to other related scientific societies in Canada. To help bring the often separate science communities together, CGU is currently in discussions with both the Canadian Meteorological and Oceanographic Society (CMOS) and the Canadian Geomorphology Research Group (CGRG). We will keep you informed of progress on these fronts.

I look forward to seeing many of you in Banff this May.

Philip Marsh
President, CGU

LITHOPROBE – Lessons and Benefits from a Successful Megaproject

Ron M. Clowes

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LITHOPROBE is an Earth science megaproject that has been the focus of much solid earth science research in Canada for 20 years. Based on the quality and quantity of its scientific results, its contributions to industry, its training of the next generation of Earth scientists and its strong public education and outreach programs, LITHOPROBE has been an outstanding success. It has brought many benefits to Canada. Moreover, LITHOPROBE

has strongly influenced the manner in which Earth science research is now conducted in Canada. In this summary, I will reflect briefly on some of the lessons and benefits that have derived from the project.

Some of the Lessons

- *'Grassroots' involvement and development:* From an historical perspective, LITHOPROBE was initiated through the efforts of 'grassroots' solid earth scientists from the universities and the Geological Survey of Canada (GSC) who recognized the need for a dedicated project of high scientific significance to provide a flagship for, enhance the quality of, and bring cohesion to, their discipline. The concept of LITHOPROBE as a project evolved from a 1981 meeting of university geoscientists to discuss "Earth Sciences in the Eighties", sponsored by NSERC, and similar ideas being discussed at the GSC (CANDEL, 1981). Subsequently, a LITHOPROBE Steering Committee, comprising highly respected representatives from academia, the GSC and the petroleum and mining industries, was formed. Following a successful Phase I program on Vancouver Island with some preliminary studies in the Kapuskasing Structural Zone Transect (Clowes, 1984; Clowes et al., 1984), a Phase II proposal, which received strong support through a 1985 national LITHOPROBE workshop, was developed. The success of the Phase II proposal led to establishment of LITHOPROBE as a continuing project in 1987.
- *Widespread support from the community:* For a megaproject to be successful, it must receive widespread support from the involved community. LITHOPROBE has received such support, but it also had to earn some of that support by its activities. One such activity was the University Supporting Geoscience Projects program of research grants, available to all NSERC-eligible scientists on a competitive basis. Support also was engendered by a cross-Canada lecture tour by the Director within the first 1-2 years of the project to show the value of the project for the community at large and to respond to concerns and criticisms.
- *Multidisciplinary research:* The key to the scientific success of LITHOPROBE is the true multidisciplinary nature of its studies (Figure 1). Within the research in its 10 transects, virtually all techniques associated with modern Earth science have been applied. The multidisciplinary aspect of the project also distinguishes it from other national and international lithospheric projects that use seismic methods as their focus. LITHOPROBE has been a role model for multidisciplinary research. Other programs have emulated this approach.
- *Collaborative studies:* From its inception, LITHOPROBE was envisioned very much as a collaborative project among the university community, the Geological Survey of Canada,

provincial/territorial geological surveys and the petroleum and mining industries (Figure 2). Recognition that provincial/territorial surveys and industry could only participate when research was in their regions of jurisdiction or interest was important. Both direct and in-kind support from these sectors was crucial to the success of the project, but scientific involvement of representatives of industry was difficult to achieve.

- *Communication and interactions:* Continuing communication to the scientists and to the public through outreach efforts is highly important to maintain enthusiasm and support for a megaproject. Public outreach and education needs to be a defined activity, both for the project and the broader Earth science disciplines. In LITHOPROBE, transect and pan-LITHOPROBE workshops provided a key forum for interaction among representatives of all sectors. An extensive outreach program brought LITHOPROBE activities and results to the attention of educators and the general public (through the media).
- *Management structure:* As the first national centre of excellence or research network, LITHOPROBE established an efficient and effective management structure. This was clearly recognized by our funding agencies. As a result, the LITHOPROBE management structure has been emulated in general terms by projects supported through the Networks of Centres of Excellence program and the NSERC Research Networks program, both of which postdated the establishment of LITHOPROBE.

Some of the Benefits

- *Regional information for industry.* The new and improved understanding of Earth history in regions that are amenable to resource exploration provides petroleum and mining companies with an enhanced knowledge base from which their own more detailed exploration and development plans can be prepared. In the Western Canada Sedimentary Basin, the first continuous seismic reflection profile across the entire basin has been compiled. In a variety of mining locations associated with base metals, diamonds and uranium throughout Canada, LITHOPROBE studies provide a valuable framework of knowledge and understanding that otherwise would not exist.
- *Technological innovation and transfer of science and technology to the private sector.* In the mid-1980s, LITHOPROBE seismologists designed a new portable seismic refraction seismograph, the technology for which was transferred to Scintrex Ltd., a Canadian geophysical company. GSC scientists active in LITHOPROBE designed and built new magnetotelluric

(MT) instrumentation for which the resultant technology was transferred to Phoenix Geophysics Ltd., a Canadian geophysical company that specializes in MT work.

LITHOPROBE and related studies have demonstrated the applicability of the high resolution seismic reflection technique to base metal mineral exploration problems, particularly in mining regions where expensive infrastructure is already in place. High resolution seismic reflection studies, applied first by LITHOPROBE and now being refined in the private sector, are identifying new sub-basins and faults associated with uranium deposits in northern Saskatchewan. In a unique spin-off experiment, the applicability of mapping a very thin, dipping, diamondiferous kimberlite dyke from subcrop to 1500 m depth has been demonstrated.

- *New resources and mitigation of hazards.* During the 1990s, LITHOPROBE data and interpretations in the LITHOPROBE East Transect contributed to a petroleum discovery on the west coast of Newfoundland. LITHOPROBE studies on the west coast of Canada, as part of the Southern Cordillera Transect, provided data and a framework for better understanding the mega-thrust earthquake hazard in the region. GSC scientists are continuing and extending such research in the region, thus contributing to a much more fundamental understanding of the hazard and how it may affect the region.
- *Training the next generation of earth scientists.* LITHOPROBE has actively involved more than 450 graduate and undergraduate students, postdoctoral fellows, and research associates who have learned their specific skills in an environment of multidisciplinary collaboration. Many of these scientists have gone on to employment in academia, government, and industry worldwide.
- *Education and public awareness of science and technology.* LITHOPROBE has provided educational material that has been used from grade schools to university graduate courses. It has enhanced the visibility and relevance of the earth sciences as a discipline through a coordinated effort of public education and media communication. Recently a children's book (ages 9-14), based on results from LITHOPROBE, has been published (Wilson, 2003). To encourage the use of this book in the earth science

curriculum in the middle grades at Canadian schools, a comprehensive Teachers' Guide has just been completed. It will be published on the LITHOPROBE web site and distributed in CD format upon request.

- *A new approach to collaborative science in Canada.* The LITHOPROBE research network has redefined the nature of much earth science research in Canada. It has successfully fostered an unprecedented degree of cooperation among earth scientists in universities, federal and provincial/territorial geological surveys, and the mining and petroleum industries. It has spawned a new and healthy atmosphere of scientific cooperation among geologists, geophysicists, and geochemists who are working and learning together, thereby enhancing results beyond those that could be achieved through any one subdiscipline.
- *Enhancing the international renown of Canadian earth science.* Quality scientific results resulting from LITHOPROBE's unique combination of collaborative research and multidisciplinary studies have been foremost in establishing the project as the best of its kind in the world. LITHOPROBE has served as a model for other network projects in Canada and around the world. Indeed, EUROPROBE, a multidisciplinary, collaborative Earth science program in Europe, selected both its name and procedures based on the LITHOPROBE example.

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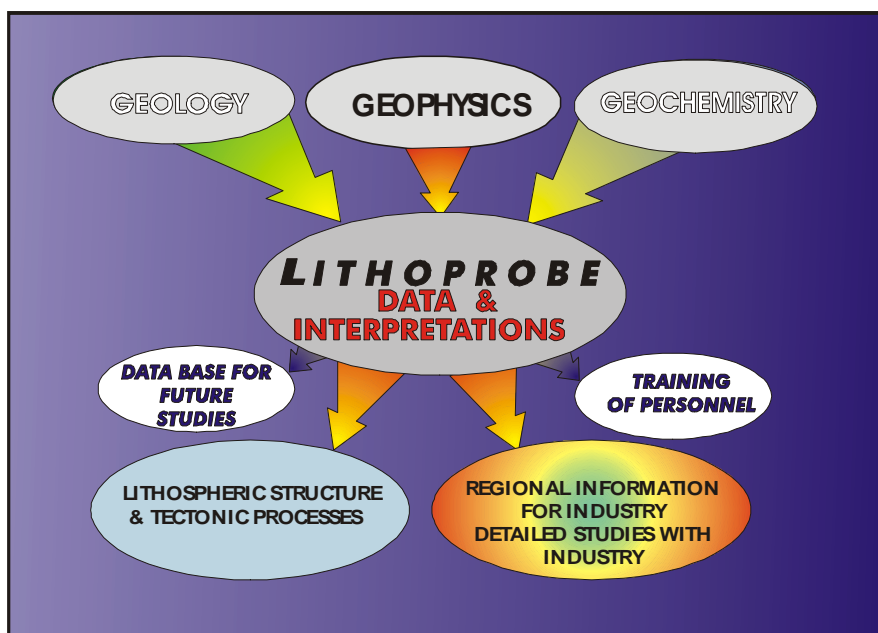


Figure 1. Illustration of the application of multidisciplinary earth science studies within LITHOPROBE and some of the scientific and societal benefits derived from the project.



Figure 2. Diagram illustrating the extent of partnerships and collaborations within LITHOPROBE. Note that all sectors have been constructively engaged in the project.

J. Tuzo Wilson Medal – Call for Nominations

The Executive of the CGU solicits nominations for the J. Tuzo Wilson Medal – 2005. The Union makes this award annually to recognize outstanding contributions to Canadian geophysics. Factors taken into account in the selection process include excellence in scientific or technical research, instrument development, industrial applications and/or teaching.

If you would like to nominate a candidate, please contact Dr. Hugh Geiger, Chair of the CGU Awards Committee, Geology and Geophysics Dept., University of Calgary, Calgary AB, T2N 1N4 (Email: geiger@ucalgary.ca, Fax: 403-284-0074). At a minimum, the nomination should be supported by letters of recommendation from colleagues, a brief biographical sketch and a Curriculum Vitae. Nominations should be submitted by February 28, 2005. Additional details concerning the nomination process can be obtained from the Chair of the CGU Awards Committee.

L'exécutif de l'UGC vous invite à suggérer des candidats pour la médaille J. Tuzo Wilson – 2005. L'Union décerne la médaille chaque année "en reconnaissance d'une contribution remarquable à la géophysique canadienne". En choisissant parmi les candidats, on considère les accomplissements en recherches scientifique ou technologiques, aux développements d'instruments, aux applications industrielles et/ou à l'enseignement.

Si vous désirez suggérer un candidat pour cette médaille, s.v.p. contacter Dr. Hugh Geiger, Président du Comité des Prix d'Excellence, Geology and Geophysics Dept., University of Calgary, Calgary AB, T2N 1N4 (Email: geiger@ucalgary.ca, Fax: 403-284-0074). Les nominations doivent être supportées de lettres de recommandation de collègues, d'un bref sommaire biographique et d'un Curriculum Vitae. Les nominations

doivent être soumises avant le 28 février, 2005. Des détails additionnels concernant le processus de nomination peuvent être obtenus en communiquant avec le Président du Comité des Prix d'Excellence de l'UGC.

Past Wilson Medallists

1978	J. Tuzo Wilson
1979	Roy O. Lindseth
1980	Larry W. Morley
1981	George D. Garland
1982	Jack A. Jacobs
1983	D. Ian Gough
1984	Ted Irving
1985	Harold O. Seigel
1986	Michael Rochester
1987	David Strangway
1988	Ernie Kanasevich
1989	Leonard S. Collett
1990	Gordon F. West
1991	Thomas Krogh
1992	R. Don Russell
1993	Alan E. Beck
1994	Michael J. Berry
1995	Charlotte Keen
1996	Petr Vaniček
1997	Chris Beaumont
1998	Ron M. Clowes
1999	David Dunlop
2000	Don Gray
2001	Roy Hyndman
2002	Doug Smylie
2003	Garry K.C. Clarke
2004	W.R. (Dick) Peltier

The CGU 2004 J. Tuzo Wilson Medallist: W.R. (Dick) Peltier

Citations by Claude Hillaire-Marcel (at the AGU-CGU-SEG 2004 Meeting, May 17-21, Montreal)

Citation, AGU-CGU Awards Ceremony, May 19, 2004

Professor Richard Peltier ranks among the world's top and most highly cited Earth Scientists and his work has touched deeply on both surface and subsurface geological processes. His early pioneering work on the mathematical theory of glacial isostatic processes and sea level changes has led recently to tremendous insights into the thickness history of ice-sheets during the last glaciation: a contribution that is now used internationally to help reconstruct ice-age climates.

In addition Dick's models of intermittent mantle convection processes have strongly helped understanding supercontinent creation and destruction.

These two fields of research have come together in Professor Peltier's more recent work on the climate system at time scales ranging from the relatively recent to deep past of the Earth's history. Both his personal contributions to this field as well as his efforts to promote and lead a Canada-wide collaborative program on climate system and dynamics have led to major improvements in our

understanding of climatic cycles and on the evolution of life on this planet.

Dick is highly sought after, as a keynote speaker at major international forums on geological processes. This, added to the supervision of near a hundred graduate students and post-doctoral fellows, many of them now already recognized scientists, have greatly contributed to Canada's reputation in Earth Sciences. By awarding him its most prestigious award, the J. Tuzo Wilson Medal, the Canadian Geophysical Union acknowledges one of the most brilliant contributions to geophysics and geodynamics of the last few decades, both at Canadian and International scales.

Acceptance by W.R. Peltier

Thank you Claude for these very kind remarks.

It is a very special pleasure for me to accept this award named for my former colleague Tuzo Wilson, special in several ways. Firstly because it was on account of Tuzo Wilson that I decided to do my graduate work at the University of Toronto, which I have always found to be an extremely hospitable place to pursue my research interests, both alone and together with the excellent group of graduate students and postdoctoral fellows it has been my great pleasure to work along side of. All of you who are involved in teaching research students will know that although you may do most of the giving at the "front-end" of the relationship, as they mature they invariably contribute enormously to one's own understanding. I cannot imagine that I might ever have found a better place than the University of Toronto to spend my career. I'm hoping that this can last a good deal longer!

I'm also indebted to Tuzo Wilson for another reason, one that has everything to do with what makes a research environment liveable as well as productive intellectually. Tuzo had a great gift for the positive in his human relations, as anyone would appreciate who knew him in any one of the several administrative capacities in which he served at the several "ends" of his professional career, including his stint as President of the American Geophysical Union. He was entirely the opposite of a vengeful person, one who always went out of his way to put things right at the human level. In reflecting upon the working environment I found at Toronto when I first began there as a graduate student, and having now experienced enough to know how unique it was, I realize how great an influence he had on that aspect of the place.

One other comment that I will make, concerning the environment in which I continue to function, is how important it has been to my own work to be able to do it in the context of a modern physics department, but one which has remained open to providing a home for scientists working on atmospheres and oceans as well as on solid earth geophysical topics. You will all know how unusual in a North American context such an arrangement has

become. Most of us working in the geophysical sciences find ourselves "siloed" into departments which are very much more narrowly focused than this and I think personally that the quality and perhaps also the originality of our science loses as a consequence. My colleagues and I who work in the "classical physics" related areas at Toronto discharge our undergraduate teaching responsibilities by offering courses in the core physics curriculum and benefit by having the opportunity to gain exposure for our science among a talented group of highly numerate young undergraduates. Who can tell how many are thereby "saved" from the lonely life of a string theorist!

Once again, I am very grateful to the Canadian Geophysical Union for honouring me by the award of the medal named for my former colleague.

Citation, CGU Awards Luncheon, May 21, 2004

Mr. President, esteemed colleagues,

After the great solemnity of the joint ceremonies with our American colleagues, it is a very great pleasure and honour for me to review, in the more or less intimate setting of this luncheon of our association, some of the achievements of the 2004 recipient of the J. Tuzo Wilson Medal, Professor Richard Peltier—Dick, to his friends and colleagues.

I should first mention that, when the sponsors of this nomination asked me a few months ago to join them in their efforts, my first reaction was surprise: how can it be, I said to myself, that this distinction has not already been awarded to him. I can explain my reaction in the following way: if I had to name point-blank a single Canadian scientist who has done more than anyone else in the world over the past two decades to expand our knowledge at the frontiers of geophysics and external and internal geodynamics, the name Dick Peltier would immediately spring to mind.

In fact, Professor Peltier's research and teaching career in Earth Science has strongly impacted a wide range of the most pressing problems in the discipline. His original work on the mathematical theory of the glacial isostatic adjustment process has dominated this increasingly important field since it was first published in the early 1970s. Dick's early work in this domain focused on the problem of inferring the viscosity of the deep Earth based on rigorous inversion of glacial isostasy data. More recently, it has been concerned with reconstructing the thickness histories of the ice sheets that covered the continents during the Last Glacial Maximum (LGM). This more recent work has revitalized this area of research and is currently used internationally to provide the boundary conditions required in the application of modern general circulation models to reconstruct ice-age climate.

Concurrently with this work on glacial isostasy and Holocene sea level changes, Peltier has devoted a lot of attention to the mantle convection processes that drive surface plate-tectonic interactions. This led him to develop models involving intermittent behaviours, possibly linked to the Wilson cycle of supercontinent creation and destruction. Dick also developed complementary models based on the use of seismic tomographic images of the lateral heterogeneity of the deep mantle to predict the structure of the surface gravitational field and thereby further constrain the viscosity structure of the deep Earth as well as the Earth's dynamic topography.

Closer to my own area of scientific specialization, Dick Peltier has played a major role, in both the national and international communities, in paleoclimatic modeling. In this field, Dick Peltier, more than any other modeling expert, has demonstrated an exceptional understanding of all the mechanisms involved and a unique ability to adapt the models to the reality of geological observations. In fact, of all the experts in paleoclimatic modeling, Dick Peltier stands out because of his profound knowledge of glacial dynamics, of the parameters of littoral dynamics and of the geological monitoring of sea levels. Dick's work in this area led to the development of the NSERC sponsored Canadian national programme in Climate System History and Dynamics, of which he has been Principle Investigator, and to the forthcoming Collaborative Programme in Polar Climate Stability, both of which have involved different Canadian university and government laboratories. His personal contributions to these national programs have included the development of detailed reconstructions of global LGM climate using the ICE-4G (VM2) boundary conditions derived from his work on glacial isostasy, as well as the development of the first successful model of the 100 kyr oscillation of Pleistocene ice cover as a response to orbital insolation change. This model, which has been successfully used to explain the detailed evolution of the Laurentide ice sheet which last covered the Canadian landmass at LGM, has also been employed successfully to explain the Carboniferous glaciation of Pangaea and the "near-snowball" Neoproterozoic glaciation that occurred prior to the Cambrian "explosion of life."

I could add further fine examples of Dick's accomplishments, but I will simply point out here that his work is widely recognized. Dick is probably one of the Canadian keynote speakers most frequently invited to international meetings. He was singled out by the Highly Cited Project (Science Watch, Volume 12, No. 6, Nov-Dec. 2001) as the fifth most highly cited Earth scientist in the world in the decade from 1991-2001.

His work as a supervisor is also outstanding: nearly a 100 MScs, PhDs and PDFs worked under his guidance since his appointment at the University of Toronto. The personal achievements of so many of Dick's former students and collaborators, some of whom are with us

today, is so impressive that one has no other choice than to conclude that such an accomplishment cannot simply be just a stroke of luck!

In short, Dick, from now on, you will have to get used to being a key figure in the Canadian geoscientific community. In awarding you the J. Tuzo Wilson Medal, the CGU, to which you have devoted a great deal of energy, is giving you a long deserved token of recognition and showing its appreciation for what you have done for it and for many of us, whom you have drawn into your scientific sphere of influence,

With my heartfelt congratulations,

Claude Hillaire-Marcel

Acceptance by W.R. Peltier

Thank you again Claude for these excessively laudatory remarks that you have been kind enough to make for the second time in three days! – and thank you Gary Jarvis, incoming CGU President, for your own comments on the good times we have spent together discussing the mantle convection problem.

After having had the startling experience of seeing myself on the "Jumbotron" that was employed during the joint CGU/AGU awards ceremony the other day, I have determined that I shall never again enter a karaoke bar for any reason! I'm glad that this event is considerably more informal.

Claude has commented especially upon the role that I have played over the past many years in graduate education and thereby hit upon what I consider to have been the most satisfying aspect of my career to date in the geophysical sciences. When you have had the opportunity as I have to work with people of the caliber of Gary Jarvis and David Yuen on mantle convection, of Patrick Wu and Detlef Wolf on the glacial isostatic adjustment problem, of Gary Klaassen and Bill Smyth on the turbulence transition in stratified parallel flows, of Saroja Polavarapu and Andy Bush on the baroclinic instability process, and the equally impressive group of students who have completed doctoral degrees with me more recently, you really do have a great deal to be thankful for in your professional life. Of the approximately 30 PhD students with whom I have worked, most are now in excellent positions in university or government laboratories and I continue to follow their careers with great interest and no small amount of pride.

I also want to comment on the important role that Tuzo Wilson has played in my own career. I was attracted to doing my graduate work at the University of Toronto after hearing him speak at the University of British Columbia when I was a third year student in the Physics and Geophysics programme there. Since I have never regretted the decision to make my career in the department at

Toronto when the opportunity to do so was offered to me I do owe him a debt of gratitude. I thought that some of you might be interested in reading an article that I was invited to write for EOS after Tuzo passed away and so have brought along a number of copies which I've placed on a table at the side of the room.

One further point on which I'd like to take this opportunity to comment concerns the very serious situation that has developed from the continuing NSERC reallocation process. You will know that our science has had its total funding envelope reduced in each of the three cycles of reallocation that have so far occurred. Clearly this is a

process that is doing real harm to the earth sciences in this country, an area in which we are widely acknowledged to be world leaders. In order to reverse this negative trend a concerted community wide organizational effort will be required, as well as effort to explain to NSERC why earth science differs so significantly from more conventional disciplines. Although the earth sciences do essentially constitute what I refer to as an "interdiscipline," and although NSERC continues to broadcast how important interdisciplinary research is to scientific progress, it seems not to be able to credit us for this most fundamental of our characteristics.



HYDROLOGY SECTION NEWS

Hydrology Section Committee Reports

Compiled by Garry Thorne, AECL Research (thorneg@aecl.ca)

MAGS

Reported by: Ming-ko Woo, MAGS Programme Leader

The Mackenzie GEWEX Study or MAGS, is the primary Canadian contribution to the Global Energy and Water Cycle Experiment (GEWEX), an international venture under the auspices of the World Climate Research Programme. As a major collaborative research effort, MAGS was created in 1994 to study the atmospheric-hydrological system of cold regions. Participation includes about 100 scientists and engineers from ten universities and government institutions across Canada, including many hydrologists who are members of CGU-HS. The goals of MAGS are to improve understanding and modelling of the atmospheric-hydrological system of the high latitudes, and to apply the scientific and engineering expertise thus acquired to address environmental and water resource problems of northern Canada.

The focus of MAGS research is on field investigation and modelling of such cold processes as winter storms, snow, ice, frost and runoff generation in cold regions. The Mackenzie Basin, covering 1.8 million km² (about one-fifth of Canada's land area), offers a variety of environments common to the North, including high mountains, boreal plains and tundra, Shield country where bedrock outcrop is interspersed with lakes, wetlands and

soil-filled valleys. Lying on the leeward side of the western Cordillera and extending from the cold temperate to the low Arctic, there is a range of climatic zones. Climatic data have also revealed large inter-annual variability and significant warming in the past 50 years (an average of 1.5°C, and even higher in the winter). The Basin provides challenging research questions that need to be addressed for environmental preservation, and human adaptation to hazards under current fluctuations and impending changes in the climate.

Atmospheric and hydrologic research accomplishments of MAGS have strengthened its international reputation. Some of the hydrological contributions are highlighted below.

1. In the boreal forest, as much as one-third of the snow intercepted by trees never reaches the ground but is returned directly to the atmosphere by sublimation. In open tundra and the prairies, patchy snow conditions greatly enhance melt.
2. Over 90 percent of Canadian rivers develop an ice cover in winter. New insight on the dynamics of break up and extensive measurements obtained through MAGS permit the improvement of computational hydraulic models to forecast the ice jam release surges and their associated floods.
3. Ice-rich permafrost limits infiltration to enhance

runoff production. Stefan's freeze-thaw algorithm is tested for coupling with land surface schemes to model frozen soil hydrology.

4. The organic layer in tundra, mountain and wetland soils has high porosity and hydraulic conductivity, generating quick flow when the water table lies in this layer. Otherwise only scanty slow flow may be released from the mineral soil.
5. Crystalline rock surfaces in the Canadian Shield, widely considered to be essentially impervious, have extensive, intersecting cracks that permit water seepage and, consequently, yield much less runoff than previously anticipated.
6. Hydrological studies of northern lakes, including Great Slave and Great Bear lakes, demonstrate that lake size and ice cover duration significantly affect their thermal evaporation regime.
7. Process studies help refine the Canadian Land Surface Scheme (CLASS) which is now coupled with a hydrological model to create WATCLASS. A suite of models, including WATCLASS, improves our capacity to evaluate water resources in cold regions.

Over the years, research data from MAGS has been used in the education of 30 Post-doctoral fellows, 70 PhD students, over 100 Masters students, and at least 50 undergraduate students. MAGS results are widely published in refereed journals of international standing. Further information on MAGS is available on the website <http://www.usask.ca/geography/MAGS/>.

Northern Research Basins

Reported by: Philip Marsh, Canadian Chief Delegate to the NRB, philip.marsh@ec.gc.ca

NORTHERN RESEARCH BASINS - 15th International Symposium and Workshop, 29 August to 2 September, 2005, Lulea to Kvikkjokk, Sweden

Under the Canadian Geophysical Union-Hydrology Section umbrella, Canada has a working group on Northern Research Basins(NRB). The NRB (membership countries include USA, Canada, Iceland, Norway, Sweden, Finland, Denmark, and Russia) meets every 2 years to present papers, hold workshops and exchange ideas on Northern hydrology.

As outlined by the NRB Mandate, the official Canadian Delegation is set at a maximum of 10. This Canadian Delegation is by invitation of the CGU-HS Committee on NRB (CNRB) and approved by the CGU-HS Executive. The CNRB will invite 10 Canadian hydrologist to represent the range of Canadian northern hydrology. In addition, other Canadians may submit abstracts and if approved by the organizers, attend the

meeting. However, due to the locations of many NRB meetings in remote locations, space is often very limited. Please note that abstracts and pre-registration is due by October 1, 2004.

The next meeting of the NRB working group will be in Sweden from Aug 29 to Sept 2, 2005. The main theme of the 15th NRB is "Links between human activities and high latitude hydrological systems". Papers and posters on regional and local importance of change in the Arctic to hydrological processes are requested, this theme will stress the increased demands placed on the water systems of cold regions over the last 30 years whether it be energy production (e.g., the oil and hydropower industries), new industries (e.g., eco-tourism) or social change within Arctic communities (e.g., urbanisation and development). The change in focus will open the NRB community to new disciplines such as ecology and social sciences. In addition there will be a number of task force reports. Details on these will be available in the near future. Papers presented at the meeting will be published in the symposium proceedings, and can also be submitted for publication in the peer reviewed journal *Nordic Hydrology*. Complete details on the meeting are contained on the following web page: http://aqua.tvrl.lth.se/NRB_2005.html.

Past CGU-HS Student Award Winners

D.M. Gray Award for Best Student Paper in Hydrology:

1995: John Gibson, University of Waterloo,
Title: *Validity of an Isotopic Method for Estimation of Lake Evaporation*

1996: Jane Rea, University of British Columbia,
(Co-author: R. Knight)
Title: *Determining Hydrogeologic Length Scales for Ground Penetrating Radar Data*

1997: Newell Hedstrom, University of Saskatchewan
(Co-author: J. Pomeroy)
Title: *Accumulation of Intercepted Snow in the Boreal Forest: Measurements and Modeling*

1998: Martin Lacroix, University of Saskatchewan,
(Co-author: L.W. Martz)
Title: *Assessing the Effect of Varying Sub-Basin Scale on Hydrological Model Response*

1999: Gwenn Flowers, University of British Columbia,
(Co-author: G. Clarke)
Title: *Modelling Constituent Interactions in Glacier Hydrology*

2000: Dan Peters, Trent University,
(Co-author: T.D. Prowse)
Title: *Impact of Reservoir Operation on Peace River Delta Flows 1968-96*

2001: Richard Petrone, University of Waterloo,
(Co-authors: J.M. Waddington and J.S. Price)
Title: *Ecosystem Scale Evapotranspiration and Net CO₂ Exchange from a Restored Peatland*

2002: Luigi Romolo, University of Saskatchewan,
(Co-authors: T.D. Prowse, D. Blair, B. Bonsal, and L.W. Martz)
Title: *The Synoptic Climate Controls on Snow Pack Accumulation in the Upper Reaches of the Peace River Basin*

2003: Merrin Macrae, Wilfrid Laurier University,
(Co-authors: M.C. English, S.L. Schiff, and M. Stone),
Title: *Temporal Patterns of Nutrient Export from a First-order Agricultural Basin in Southern Ontario*

2004: Maria Strack, McMaster University
(Co-author: J.M. Waddington)
Title: *Ecohydrological Controls on Natural and Drained Peatland Methane Emissions: Implications for Climate Change*

Campbell Scientific Award for Best Student Poster in Hydrology:

2000: Erica Leenders, McMaster University,
(Co-author: Ming-ko Woo)
Title: *Hydrology of the Transition Zone between the Subarctic Open Woodland and Subalpine Shrubland*

2001: Claire J. Oswald, McMaster University,
(Co-author: W.R. Rouse)
Title: *Evaporation and Lake Size in the Mackenzie River Basin*

2002: Steve Kaufman, McMaster University,
(Co-author: J.M. Waddington)
Title: *Spatio-Temporal Variability in Runoff Generation Processes in a Temperate Forested Swamp*

2003: Murray Richardson, University of Toronto,
(Co-authors: B.A. Branfireun and V.B. Robinson),
Title: *The Wetland Object Model (WOM): A Geographic Object-Based Simulation Framework for Studies in Wetland Ecohydrology*

2004: Cherie Westbrook, Colorado State University
(Co-authors: D.J. Cooper, B.W. Baker and L.H. MacDonald)
Title: *Relative Importance of Beaver and Low Recurrence Interval Floods in Controlling Water Table Position in Mountain Riparian Wetlands*

GEODESY SECTION NEWS

Reported by Marcelo Santos

The Geodesy Section of the Canadian Geophysical Union had an important series of activities during the past Canadian Geophysical Union/American Geophysical Union Joint Meeting 2004, held in Montreal, May 17-21, 2004: Meeting of the Executive, Annual General Meeting, Student Paper Competition and the Eighth Geoid Workshop.

During the Annual General Meeting, the **Executive** for 2004-2006 was elected. The executive is:

President: Prof. S. Pagiatakis (York University)
Vice President: Dr. C. Klatt (NRCan, Geodetic Survey)
Secretary: Prof. M. Santos (University of New Brunswick)
Treasurer: Prof. R. Blais (University of Calgary)
Members-at-Large: Dr. H. Dragert (NRCan, Geological Survey), Prof. N. Sneeuw (University of Calgary)

There were eight **student papers** competing for the \$500 prize awarded by the Geodesy Section sponsored by the Geodetic Survey Division of NRCan. The winner was Mr. Rodrigo Leandro, a PhD student from the Department of Geodesy and Geomatics Engineering, University of New Brunswick. The competing papers were:

- Mohamed El-Habiby: Linear versus Non-Linear Least Squares Adjustment with emphasis on the 3-D Coordinates Transformation Problem
- Rodrigo Leandro: Regional Computation of TEC using a Neural Network Model.
- Robert Kingdon: Calculation of the spherical terrain correction to Helmert's orthometric height

- Azadeh Koohzare: Glacial Isostatic Adjustment Observed using Historical Tide Gauge Records and Precise Relevelling Data in Eastern Canada
- Mazhar Rafiq: Study of Eastern Canadian coastal site displacement due to ocean tide loading using a GPS network in Atlantic Canada
- Matthias Weigelt: CHAMP Gravity Results using the Energy Integral Approach with Emphasis on Algorithmic Aspects
- Huaining Yang: Atmospheric effects in the three-space scenario for the Stokes-Helmert Method of geoid determination
- Chen Xu: Satellite Formation Flying for Geodetic applications: Analysis of J2-Disturbed Orbits

The ***Eight Geoid Workshop*** was an activity that took place on 16 May 2004, the Sunday before the AGU/CGU Meeting. This year, the Workshop was mostly taken by

presentations and discussions related to two GEOIDE/NCE projects, namely “Seamless Vertical Reference System for Geomatics Applications,” and “Precise Geoid Determination.” Several geodesy students from all over Canada participated, giving presentations and contributing to the discussions. There were also discussions on three approved GEOIDE/NCE projects (pending on the extension of the Network): “Mapping the ocean surface with geodetic and oceanographic tools”, “Space gravimetry contributions to Earth monitoring” and “Next-generation algorithms for navigation, geodesy and earth sciences under modernized Global Navigation Satellite Systems (GNSS)”. A picture of the participants of the Workshop is shown below.

Past and Future Meetings related to Geodesy:

- Report on the *3rd International VLBI Service General Meeting*, Ottawa, 9-11 February, 2004.
- *XV International Symposium on Earth Tides*, Ottawa, 2-6 August 2004
(<http://www.eas.yorku.ca/ETS-2004/ets.html>).



Eight Geoid Workshop: photo taken on 16 May, 2004, by Marcelo Santos.

*****Call for Papers*****

39th Annual CMOS Congress, May 31 – June 3, 2005

Abstract Submission Deadline: Feb 18 2005.

Members of the Canadian Meteorological and Oceanographic Society and other interested persons are invited to submit abstracts for oral and poster presentation at the CMOS "Sea to Sky" Congress to be held near beautiful Vancouver, British Columbia, Canada. The Annual CMOS Congress is the foremost venue in Canada for the oceanographic and meteorological community in government, academia, and private industry.

Contributions are sought on theoretical, observational, and technical aspects of oceanography and meteorology at all scales. We anticipate papers related to remote sensing of the oceans, atmosphere, and land, current meteorological and oceanographic observational programs, biological/physical coupling, regional and coastal oceanography, laboratory and numerical modeling of geophysical fluids, urban and biometeorology, climate modeling, prediction, and impacts, and weather forecasting issues.

In addition to contributed papers there will be plenary speakers on a range of topics, a commercial exhibitors gallery, social events including an Icebreaker, the annual Awards Luncheon, the CMOS banquet, a partners program, and a daily weather briefing for aficionados. The following special sessions are currently planned:

- Health Issues in Weather and Climate
- Chemical Composition of the Troposphere
- GPS Atmospheric Moisture Retrieval and Applications
- Atmospheric Community Modeling
- Statistics in Oceanography and Meteorology
- Ocean/Cyclone Interactions
-
- Air Quality Forecasting
- Decision Support Systems for Forecasting
- Broadcast Meteorology
- Ocean Observatories

Early Registration Deadline: April 15 2005.

- The 2007 International Polar Year and the Future of Polar Science
- Canadian Arctic Shelf Exchange Study (CASES) and Related Research
- Physical impacts on Ocean Ecosystems
- Ocean-Atmosphere Interactions and Their Influence on Ocean Biogeochemistry
- Advances in Private Sector Meteorology and Oceanography
- Offshore Environmental Factors for Oil and Gas Development
- The Role of Terrestrial and Oceanic Biogeochemical Cycles in the Climate System
- Lawrence Mysak Session on Ocean and Climate Dynamics
- Norman McFarlane Session on Physical and Numerical Aspects of Climate Modeling

Special sessions will feature at least one invited introductory or overview talk. It is anticipated that these sessions will form about one third of the program. Papers not designated for special sessions will be grouped with others of similar technical content. Multiple same first-author submissions are discouraged in order to limit the number of parallel sessions. Late submissions will be accepted ONLY if space permits. An expanded program of posters will foster more personal interactions.

Student CMOS members are welcomed and encouraged to apply for a Student Travel Bursary when submitting an abstract.

For conference details including plenary speakers and descriptions of the special sessions, instructions on electronic abstract submittal and presentation format, registration, hotel, travel and exhibitor information please see the conference web site www.cmos2005.ubc.ca or contact the program organizers at the following email address: congress2005@cmos.ca.

CGU Annual Meeting / UGC Rencontre Annuelle / May 8-11 Mai, Banff, Alberta

Abstract Deadline: 11 February 2005

For more information: <http://www.ucalgary.ca/~cguconf> or <http://www.cgu-ugc.ca>



WESTJET offers CGU delegates a 10% discount off their best available fare at the time of booking (excluding seat sales).

Delegates must book through WestJet Specialty Sales by email or fax quoting **QC #2862**
specialproducts@westjet.com OR FAX 1-800-582-7072

Discounted rates are available for travel up to 3 days prior and 3 days after CGU meeting. For flight schedules visit website at www.westjet.com.

New Tenure Track Position: Atmospheric Modelling, Department of Earth Sciences, University of Waterloo

The University of Waterloo has an immediate tenure track position in Atmospheric-Terrestrial Modelling. We seek an outstanding candidate who is capable of building a strong research program in modeling climate-related atmospheric-terrestrial interactions. Preference will be given to research areas that complement existing atmospheric, and environmental hydrologic and geochemical programs in the Faculty of Science. Appointment is at the Assistant Professor level but outstanding candidates will also be considered at the Associate Professor level. Evaluation of candidates will continue until the position is filled. A complete application must include a curriculum vitae of the candidate, a statement outlining the collaborative nature of the research program, two recent publications and the names of at least three referees. The Department of Earth Sciences at the University of Waterloo has a well-funded and diverse research program involving 20 full time faculty members, 8 research faculty members, 35 research staff and over 90 graduate students. The successful candidate will be eligible to join the Waterloo Centre for Atmospheric Sciences(<http://science.uwaterloo.ca/wcas/>),

a consortium of academic, public and private sector scientists engaged in regional atmospheric modeling, laboratory aerosol research and atmospheric remote sensing. Inter-departmental ties and research are encouraged at the University of Waterloo. Active collaborations and cross-appointments exist with researchers in other departments including Civil, Mechanical and Chemical Engineering, Biology, Chemistry, Geography and Computer Science. Waterloo also hosts the Canadian Water Network, a national Network of Centres of Excellence (<http://www.cwn-rce.ca>). The University of Waterloo encourages applications from all qualified individuals, including women, members of visible minorities, native people and persons with disabilities. All qualified candidates are encouraged to apply; however Canadians and permanent residents will be given priority. This appointment is subject to the availability of funds. Applications should be directed to Dr. Sherry Schiff, Chair: Search Committee, Department of Earth Sciences, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1 (email: klalbrec@sciborg.uwaterloo.ca).

Graduate study in water resources

The University of Calgary (www.geo.ucalgary.ca) has a funded position for Ph.D. student in the integrated study of surface and groundwater resources in the prairies. An ideal candidate will have strong backgrounds in physical hydrology of surface and subsurface, demonstrated

experience in fieldwork and numerical simulation, and excellent oral and written communication skills. A letter of intent, CV, transcripts, and the name and address of three references should be sent to Dr. Masaki Hayashi (hayashi@ucalgary.ca) by January 31, 2005.

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Editor's Note: ELEMENTS, the newsletter for the Canadian Geophysical Union, is published and distributed to all CGU members twice each year; one Summer issue and one Winter issue. We welcome submissions from members regarding meeting announcements or summaries, awards, division news, etc. Advertisements for employment opportunities in geophysics will be included for a nominal charge (contact the Editor). Notices of post-doctoral fellowship positions available will be included free of charge.

General submissions should be sent to the Editor:

Prof. E.S. Krebs, Geology and Geophysics Dept., University of Calgary, Calgary, Alberta, Canada, T2N 1N4. Telephone: (403) 220-5028; Fax: (403) 284-0074; Email: krebes@ucalgary.ca.

Hydrology-specific submissions should be sent to:
Dr. Garry Thorne, Email: thorneg@aecl.ca.

Geodesy-specific submissions should be sent to:
Prof. Marcelo Santos, Email: msantos@unb.ca

Electronic submission is encouraged.

**Canadian
Geophysical
Union**



**Union
Géophysique
Canadienne**

May 8-11 Mai, 2005

The Banff Centre

www.ucalgary.ca/~cguconf

**ANNUAL MEETING / RENCONTRE ANNUELLE
... CGU/UGC ...**

Geodesy

Wetlands

Natural Hazards

General Hydrology

Tectonics and Seismology

Earth System Science

Gravity and Geocomputations

Mackenzie GEWEX Study

Climate System History/Dynamics

International Polar Year 2007

Student Awards / Bourses: Best Papers & Travel

Field Trip / Excursion: Columbia Icefield, May 8 Mai

Abstracts / Résumés: Feb. 11 Fév., 2005

Photo: Scott Rowed