

# Elements



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## CGU EXECUTIVE COMMITTEE

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**PRESIDENT'S COLUMN** Following the note in the last CGU newsletter Elements soliciting proposals for the 1998 CGU annual scientific meeting in eastern Canada, I am pleased to report that we have received three. The first two are, Quebec City (Chateau Frontenac), and Kingston Ontario (Queens University). To these has been added initial contact from the American Geophysical Union suggesting that their spring meeting be held in eastern Canada jointly with the CGU. The AGU eastern meeting in recent years has been in Baltimore. Such a joint AGU/CGU meeting requires a large conference facility; Montreal is one suggestion. Your CGU executive will be reviewing the proposals at their November meeting in Victoria. Input from members is welcome. Speaking for the CGU, I would like to express my sincere thanks to the groups that have taken the considerable trouble of making proposals for the 1998 annual meeting. The success of the CGU greatly depends on this kind of volunteer effort by its members. For the locations not chosen for 1998, we would appreciate the proposals being carried forward to future eastern Canada meetings. I expect the 1999 meeting to be back in Banff, but no formal decision has yet been made.

For the coming 1997 meeting in Banff, I have two requests. The first is nominations for the CGU J. Tuzo Wilson medal for contributions to geophysics in Canada. Over the past years, this medal has provided recognition of many outstanding Canadian geophysicists (see below). However, the Awards committee depends on nominations from the CGU membership. For information or to make a nomination, contact Ted Glen, chairman of the awards committee (vwegl@chevron.com). The second request is suggestions for the President's Plenary Session at the coming annual meeting in Banff. Do you know a good speaker who can present a topic of general interest to the whole meeting? Or, a topic on which you would like to hear a review; for us to find a speaker? The speakers can be from anywhere in the world (of course our Treasurer reminds me of the CGU's modest financial means for travel support). And, plan now for the annual CGU meeting in the spring. Our capable Calgary team is already very busy with preparations. I encourage the session coordinators to be pro active in soliciting papers for their sessions. And for everyone, I look forward to seeing you in Banff. - Roy Hyndman

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## **J. TUZO WILSON MEDALISTS SINCE 1978**

1978 J.Tuzo Wilson  
1979 Roy O. Lindseth  
1980 Larry Morley  
1981 George Garland  
1982 Jack Jacobs  
1983 D. Ian Gough  
1984 Ted Irving  
1985 Harold Seigel  
1986 Mike Rochester

1987 David Strangway  
1988 Ernie Kanesevich  
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 Vanicek

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### SEEKING VOLUNTEERS/SUGGESTIONS/NOMINATIONS

CGU is collecting the names of those who might wish to represent their discipline on the Canadian National Committee for the IUGG (CNC/IUGG) and serve as Canadian representatives to the various associations of IUGG. If you are interested and wish to volunteer or have a colleague whose name should be considered please contact us. As you are probably aware, NSERC has recognized CGU as the home for the CNC/IUGG. It is therefore our responsibility to ensure that this committee is properly constituted and that each of the seven associations of IUGG is well represented. Aiding us in this task will be our companion organizations: the Canadian Meteorological and Oceanographic Society (CMOS), the Geological Association of Canada, the Canadian Association of Physicists, the Canadian Institute of Geomatics and the Canadian Water Resources Association. All readers are invited to suggest names of suitable national representatives for the following associations of IUGG: International Association of Geodesy International Association of Geomagnetism and Aeronomy International Association of Hydrological Sciences International Association of Seismology and Physics of the Earth's Interior International Association of Volcanology and Chemistry

Suggestions for the Hydrological Sciences representatives may be directed to the President of the CGU Hydrology Section, whose coordinates are listed on the last page of this newsletter. (Identifying national representatives to the International Association of Meteorology and Atmospheric Science and the International Association of Physical Sciences of the Ocean is the exclusive responsibility of CMOS.) The work of the CNC/IUGG is primarily conducted by e-mail. Physical meetings, if any, would be opportunistically scheduled to coincide with scientific meetings such as the CGU annual meeting. CNC/IUGG members would be expected to pay any travel costs to international meetings of IUGG and its associations. Neither NSERC nor CGU have funds for this purpose.

If you are interested or wish to suggest other names for our consideration please contact the Past President of CGU, currently Garry Clarke, Department of Earth & Ocean Sciences, University of B.C., Vancouver V6T 1Z4. (Telephone, 604-822-3602; Fax, 604-822-6047; email: [clarke@geop.ubc.ca](mailto:clarke@geop.ubc.ca))

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## CGU/UGC 1996 ANNUAL MEETING

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### HIGHLIGHTS AND SUMMARIES

The twenty-second annual meeting was held at the Banff Conference Centre on May 5-9, 1996. In addition to the regular sessions, there were several new sessions, including Climate System History and Dynamics, Gravity and Geodesy, and Positioning and Geodynamics. The Hydrology section of the CGU organized a number of technical sessions covering all areas of hydrology, as well as a number of workshops (see HYDROLOGY SECTION NEWS). GGU non-hydrology technical sessions are summarized here.

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#### GRAVITY AND GEODESY Chair: M.R. Craymer

Eight talks and two posters were presented in the Gravity and Geodesy session, covering a wide range of topics. Blais began the session by emphasizing the need for multiresolution in geospatial applications, using the wavelet transform to decompose a signal or image into multilevel or multiband components. Six student presentations followed next, led off by Amer & Blais who presented and compared different adaptive techniques as more storage efficient alternatives to

common gridding methods for digital elevation models. Najafi followed with a discussion of the feasibility of achieving centimetre accuracy in geoid determination, outlining the most important factors that affect accuracy. Li & Sideris then compared two signal processing methods, the so-called input-output and frequency domain adjustment techniques, for combining gridded marine gravity and altimetry data. Moving to the air, Wu & Sideris compared the same two spectral methods as alternatives to collocation for processing the huge amounts of data in airborne vector gravimetry. Haworth et al. then closed out the session with a discussion of the "challenge of the decade" facing marine geoscience in determining the extent of Canada's ownership of the continental shelf as defined by the U.N. Law of the Sea (UNCLOS), which claim must be submitted to the UN within 10 years of ratifying UNCLOS. It was shown that much more data will need to be collected and new survey, interpretation and display techniques will have to be developed before such a claim can be made and supported. Two posters were also presented as part of this session. Boulanger & Chouteau discussed their 3D gravity inversion software to interpret gravity data using the criterion of compactness. Geiger et al. showed how lower crustal features of the mid-Proterozoic Great Slave Lake shear zone could be revealed using directional and adaptive filtering of Bouguer gravity anomalies.

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#### **ELECTROMAGNETICS Chair: H.W. Dosso**

The Electromagnetics session included 4 papers. Livelybrooks, Chouteau & Stevens provided the results of ground penetrating radar (GPR) measurements to examine the feasibility of using GPR to delineate ore bodies between boreholes. To do this they conducted both single hole reflection and cross hole transmission measurements in boreholes at the McConnell Deposit (near Sudbury, Ontario) using the Atomic Energy of Canada Laboratory's GPR system. Routh and Oldenburg presented two papers: one which provided a technique for inverting controlled source audio frequency magnetotelluric (CSAMT) data for a layered conductive Earth, with the data inverted being the apparent resistivity and phase from electric and magnetic fields for a dipole source; the second which provided a method for computing the EM coupling to be removed from induced polarization measurements for 2D structures. Zhang and Oldenburg discussed an inversion algorithm to simultaneously recover conductivity and susceptibility distributions using a single EM data set for a layered earth model and a horizontal loop source above the surface. Synthetic and field data were inverted to test the usefulness of the algorithm.

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#### **ENVIRONMENTAL PHYSICS Chair: K. Duckworth**

The first paper, by K. Duckworth, outlined the potential advantage of a vertical coincident coil configuration in minimizing the current gathering effect which arises in the electromagnetic exploration for mineral targets located in conductive host rocks. The second paper, by C.Y. Chan and R.J. Knight, was a student paper on the computer modelling of geophysical parameters of sand clay layers and mixtures as a function of clay volume. It was shown that the geophysical

parameters can depend on the physical geometry of the structures and the distribution of their components. Ms. Chan's overall presentation was clear, well organized and supported by effective illustrations. It was well received by the audience. The third paper, by K. Duckworth and E.S. Krebs, presented an extension of the use of the loaded coil theoretical model to the case where the loaded coil target is located below a conductive overburden. The model was applied to an evaluation of the relative performance of the horizontal coplanar and vertical coaxial coil systems. The results compared favourably with physical scale modelling tests. The presentation generated some intense interest from a small portion of the audience.

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### **LITHOPROBE Chair: D.W.S Eaton**

The Lithoprobe session was held on Monday May 6, and attracted 9 oral papers and 8 posters. The presentations covered a diverse range of subjects, from teleseismic studies of upper mantle velocity structure to new laboratory techniques for rock property measurements under in situ conditions. The first paper, by David Eaton and others, summarized seismic reflection data acquired by Lithoprobe in the Peace River Arch region in 1994. One of the most intriguing results of this survey is the observation of extensive, high-amplitude sub horizontal reflections from the middle crust, which Eaton et al. attribute to tabular mafic intrusions. The next paper, by Zoli Hajnal and others, was presented by Alex Bezdán and drew upon comparisons between different vintages of seismic reflection data together with wide angle seismic studies to provide new constraints on the crustal interpretation in the western part of the Trans Hudson Orogen. An integrated wide angle, MCS reflection and gravity study by Keith Loudon and J. Fan of crustal structure in the Grenville and Makkovik Terranes was presented next. Following this, Hugh Geiger summarized a newly developed algorithm for equivalent offset migration of seismic reflection data, with plans to apply this algorithm to data from the central Alberta transect in the near future. The next paper, by Andrew Fredericksen, M. Bostock and J. Cassidy, dealt with current tomographic studies of traveltimes residuals in the NWT and Yukon in conjunction with the SNORCLE transect. The study uses both permanent broadband stations, part of the Canadian National Seismic Network, and temporary broadband stations deployed for this experiment; considerable evidence is seen for small scale structure in the upper mantle in this region. The next paper, by Gervais Perron and A. Calvert, gave an overview of high resolution seismic studies combined with in situ logging results in the Noranda Volcanic Complex. The data indicate that impedance contrasts between different lithologies in the mining camp should be sufficient to observe these features seismically, but reconciling the seismic data with borehole control remains equivocal. Gervais was awarded the best student paper in seismology for his excellent presentation. Jim Craven, with three co authors, presented results of extensive, ongoing magnetotelluric studies in Alberta that indicate the existence of a long, linear conductor in the shallow basement and surprising reduction in the depth of the electrical asthenosphere beneath the Archean Hearn province, relative to Proterozoic domains further west. The next presentation, by Julian Lowman and G. Jarvis, provided a concise and informative overview of realistic, two-dimensional numerical modelling of mantle convection and accretion of continental lithosphere. A poster detailing the modelling results in the form of a video won Julian the award of best student poster. The final presentation of the Lithoprobe session, by Hans Mueller, S.



Raab and K. Roetzler, provided Lithoprobe scientists with a look at facilities at, and recent results from, the high pressure research lab at GFZ Potsdam, where unique measurements of elastic and electrical rock properties are being conducted under mid to lower crustal conditions.

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### **PRESIDENT'S PLENARY SESSION Chair: R.D. Hyndman**

The plenary session brought together a diverse set of three papers that described geophysical studies of the deep continental crust, mapping the ocean floor from space and the effects of river regulation on ecosystems. Gerry Ross from the Geological Survey of Canada's Institute of Sedimentary and Petroleum Geology described the remarkably clear picture that has been obtained of the deep crust and mantle beneath the thick sedimentary cover of Alberta's Western Canada Sedimentary Basin. Seismic and other geophysical data from the national LITHOPROBE program has allowed definition of not only the deep geological structure but also the several billion year geological history of the region during which a large part of the North American continent was formed. Walter Smith of the National Oceanic and Atmospheric Administration (NOAA) presented remarkably detailed maps of the topography of the seafloor obtained from satellite altimetry. Maps are now available for the global ocean floor with a spatial resolution of about 20 km. Numerous seafloor features have been discovered, especially in areas previously uncharted by conventional ship bathymetry. Perhaps most striking are the clear flow lines left by seafloor spreading, extending from ocean ridges. G.E. Petts from the University of Birmingham, U.K. made a strong case that understanding the impacts of river regulation requires a complete understanding of the river ecosystem, including the river flood plain. The ecological impacts of regulation depend not only on the minimum flows but also on the maximum flows and the detailed flow regimes.

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### **POSITIONING AND GEODYNAMICS Chair: S. Paguatakis**

The session on "Positioning and Geodynamics" was held on May 6, in the afternoon. There were only three papers, but the speakers are commended for their effort and compliance with the time limits, as well as for their clear, well prepared presentations and viewgraphs. The first paper was delivered by Robert Duval, co authored by P. Heroux, and N. Beck, all from the Geodetic Survey of Canada. Robert presented the status of the Canadian Active Control System (CACS), emphasizing its key role in the delivery of integrated GPS services across Canada. These products are being offered through subscription to the Canadian Geodetic Bulletin Board Service (CGBBS). It is recommended to explore the CGBBS now and find out how to position yourself economically and efficiently, at the metre level accuracy, with a single GPS receiver anywhere in Canada! The second paper was pre-sented by Herb Dragert, co authored by M. Schmidt, J. Henton and Y. Lu, all from the Pacific Geoscience Centre, Geological Survey of Canada. Herb presented the facts on the Western Canada Deformation Array (WCDA), a network of continuous, automated GPS tracking sites in southwestern British Columbia since 1992. The primary purpose of this array is to monitor the accumulation of strain in the Cascadia Subduction Zone, providing us with an additional effective tool to better understand the tectonic processes, that may result in a

destructive earthquake in the west coast of Canada. Yet another service of the geodetic science and geodynamics in studying the natural hazards, environmental and global change! The third paper was delivered by Don Junkins, co authored by C. Erickson, both from the Geodetic Survey of Canada. Don described version 2 of the National Transformation (NTv2) between the North American Datums of 1927 (NAD27) and 1983 (NAD83). The NTv2 supports users who have requirements to deal with NAD27 data, yet desire to work with GPS solutions or other NAD83 data. Once again, congratulations to the speakers and co authors for adding dynamically a special geodetic colour to the CGU annual meeting and to all participants, who filled the room and made the presentations worthwhile!

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### **MATHEMATICAL GEOPHYSICS Chair: C.J. Thomson**

A cross section of Geophysical research in Canada was represented by the papers of the Mathematical Geophysics session at the 1996 CGU meeting in Banff. Though small in number, six abstracts only plus one unscheduled paper, they attracted a large and participatory audience. J. Arkani Hamed and J. Dymant's paper on the conversion of global magnetic field maps to regional susceptibility maps provided ample material for discussion on the interpretation problem. S. Wang and G. Jarvis examined the role of hydrostatic pressure in mantle convection and argued that surface topography due to convective upwellings and downwellings would become larger as the Earth continues to cool. J. Lowman and G. Jarvis presented a poster showing the interaction of colliding continents and mantle convection patterns, with reorganisation of the latter following the joining of continental plates. Z. Ni and P. Wu described their new investigations into the effect of laterally varying viscosity and lithospheric mantle on postglacial rebound interpretations when axial symmetry is not assumed. I. Kay and E. Krebes explained the formidable problems with time domain viscoelastic seismic wave simulations using the finite element method, and proposed an approximate method to overcome them. P. Rouleau also talked about attenuation problems, this time from the standpoint of appropriate constitutive relations and he presented a sphere pack model for the elastodynamic properties of hydrated crust. Lastly, C. Thomson and B. Martin described the current status of their modelling of surface waves in anisotropic Earth structures of various kinds. All the papers generated questions from the audience and the general consensus was that the session was stimulating and enjoyable.

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### **GENERAL GEOPHYSICS Chair: H. Lyatsky**

As the name suggests, the General Geophysics session was an eclectic collection. It had a double charm of being genuinely multi-disciplinary and having real practical applications. The session consisted of two parts. The first four talks were about the current uses of potential field data to interpret the structure of the Earth's crust. On a very regional scale, Ghods and Arkani-Hamed (McGill) examined anomalies in satellite magnetic maps of the East Coast of Canada, linked them to major crustal structures, and discussed some mechanisms of continental margin evolution from which these structures might have resulted. On a smaller scale, Miller (Memorial) and Singh (Royal Military College, Kingston) reported on their method of enhancing



anomalies in potential field maps by computing the "strike" and "dip" of the mapped surface at any given location. The next two talks were about the uses of potential-field data in resource exploration. A UBC team of Li, Oldenburg, Shekhtman and Farquharson showed how they invert and jointly interpret different kinds of potential field data over a big sulfide deposit in New Brunswick. On the subject of Alberta geology, a Calgary team of Lyatsky (consultant), Brown and Edwards (U. of Calgary) presented their method of enhancing lineaments in potential field data to pick basement fractures and crustal block boundaries, and linked these fracture patterns to regional geologic variations, distribution of oil and gas pools, and metallic-mineralization patterns in the sediment-ary cover. To kick off the second part of the session, Tony Endres (Waterloo) talked about rock mechanics in parti-cular, about models of pore behaviour under stress and flow mechanisms of elastic wave velocity dispersion (Wardley and Endres also presented a poster about models of deformation of porous media). Derek York (U. of Toronto) discussed his contribution to a complex and important mathematical problem: how to fit a line to a set of data. Finally, Russell (consultant, Calgary) reported on the continuing efforts by some people to find economic oil pools in Alberta's Precambrian crys-talline basement. Unfortunately, the General Geophysics session coincided with the conference of the Canadian Society of Exploration Geophysicists (CSEG) which was taking place in Calgary on the same day. Better coordi-nation with the CSEG would open the doors of the CGU General Geo-physics session to the general exploration community. From such mutual expo-ure, all sides could only gain.

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### **EARTHQUAKESChair: Garry Rogers**

Much of the earthquake session this year focussed on research into the large subduction earthquakes that occur along the west coast of North America from northern California to northern Vancouver Island. Roy Hyndman started the session with a review of work done with colleagues Dragert, Wang, Rogers and Weichert of the GSC at the Pacific Geoscience Centre and UVic grad students Oleskevich, Henton and Fluek. He emphasized work done on southern Vancouver Island and pointed out that the evidence for the occurrence of these huge earthquakes was now overwhelming. Joe Henton, a UVic grad student, discussed recent crustal defor-mation studies carried out with Dragert, Schmidt and Hyndman of the GSC using the permanent GPS array set up in southwest B.C. He discussed the re-markable resolving power of the GPS array and demonstrated how it was used to constrain the locked portion of the subduction fault. UVic visiting grad student Paul Fluek discussed a 3 D dislocation model developed with Wang and Hyndman of the GSC. The work allows the faulting of the giant subduction earthquakes to be modelled with a realistic fault geometry and non uniform locking and rupture. The model provides constraints for ground motion and tsunami generation. Dan Oleskevich, another UVic grad student working with Hyndman and Wang, discussed constraints on the down dip rupture length of subduction zone earthquakes. Thermal constraints explain the length of most subduction zones but the change of rock type across the continental moho seems to be the important factor for other zones. Hyndman discussed work with GSC colleagues Weichert, Adams and Rogers on incorporating results of Cascadia earthquake studies into Canada's National Building Code pointing out that it did not change that hazard significantly because of the distance from urban areas. Following along the same line of discussion, Garry Rogers of the

GSC, in a paper coauthored with Weichert, discussed seismic hazard from crustal earthquakes in southwest B.C., pointing out for most structures in the urban areas the more frequent earthquakes in the continental crust represent a greater hazard than the Cascadia subduction quake. He also discussed the difficulties in obtaining a robust hazard estimate from crustal earthquake in that region. Hasegawa and Wu discussed their analysis of the seismotectonic environment of three unusual earthquakes in eastern Canada, with the purpose of identifying the conditions necessary for their occurrence. Changing the subject matter D. Livelybrooks of Ecole Polytechnique described magnetotelluric surveys over the San Andreas Fault carried out with R. Mackie and discussed a possible explanation for the EM precursor observed before the 1989 magnitude 7 Loma Prieta earthquake. Bill Slawson of UBC presented intriguing evidence for youthful features that might indicate surface rupture in the epicentral region of the 1946 magnitude 7.3 Vancouver Island earthquake.

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### **OTHER TECHNICAL SESSIONS**

In addition, the Climate Systems History Dynamics session, organized by W.R. Peltier, had 43 papers grouped into sub sessions on history, oceans, the atmosphere ocean system, ice and carbon. The Seismology session, chaired by M. Yedlin, had 5 papers on laboratory measurements related to anisotropy, upper mantle structure, gas hydrates, multiple identification, and velocity structure from wide angle seismic data.

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### **ACKNOWLEDGEMENTS**

**by Edward S. Krebs**

In conclusion, the local organizing committee, consisting of J.A.R. Blais, P.P.C. Wu and E.S. Krebs of the University of Calgary, would like to thank all the contributors and sponsors, Chevron Canada Resources and Shell Canada, for this very successful annual meeting. The contributions of Hugh Geiger are especially appreciated for the student activities and awards, and obtaining company sponsorship. Ms. M.A. Stroh of Conference Management Services at the University of Calgary is also thanked for her expert conference services.

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### **STUDENT AWARDS - 1996 CGU ANNUAL MEETING**

CONGRATULATIONS to the following students for excellent presentations at the Annual Meeting of the CGU.

CGU Best Student Paper, \$500

**B. Abareshi**, McGill University, Montreal

(Co-author: P.H. Schuepp, McGill University)

Title: On the Potential of Neural Network Simulation in the Study of Water and Energy Balance of Northern Ecosystems.

Shell Canada, Best Student Poster Presentation, \$500

**Julian P. Lowman**, York University, North York

(Co-author: Gary T. Jarvis, York University)

Title: Continental Collisions in Wide Aspect Ratio and High Rayleigh Number Two-Dimensional Mantle Convection Models.

Chevron Canada, Outstanding Student Paper in Seismology, \$500

**Gervais Perron**, Ecole Polytechnique de Montreal,

(Co-author: A.J. Calvert, Ecole Polytechnique de Montreal)

Title: Shallow High Resolution Seismic Imaging of the Noranda Volcanic Complex, Abitibi Belt, Quebec.

D.M. Gray Award, Best Student Paper in Hydrology, \$500.

**Jane Rea**, University of British Columbia,

(Co-author: Rosemary Knight, University of British Columbia)

Title: Determining Hydrogeologic Length Scales for Ground Penetrating Radar Data.

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### **PETR VANICEK J. TUZO WILSON MEDALIST FOR 1996**

It is a special privilege to be able to give this citation for Petr Vanicek, who has given a great deal to the world of geodesy and the CGU in particular. It is particularly special for me as Petr has been my mentor for some 15 years. For those who don't know Petr, I will first give some background information. Petr hails from the Czech Republic where he obtained his engineering degree in surveying from the Czech Technical University in 1959 and later his Ph.D. in Mathematical Physics from the Czech Academy of Science in 1968. In 1967, he and his young family had already made their way to England where he worked as a scientist in the British civil service doing research in geophysics and oceanography.

Fortunately for Canada, he came to this country a couple of years later in 1969 on an NRC post doctoral fellowship. At that time this was a program designed to attract foreign scientists to Canada. This enabled him to spend a few years working at the Geodetic Survey in the then Surveys and Mapping Branch of Energy, Mines and Resources. We are certainly glad Petr took up this opportunity. Then in 1971, he accepted a professorship at the University of New Brunswick in the Department of Surveying Engineering (now the Dept. of Geodesy and Geomatics Engineering), where he has been ever since. In 1974 he and his family became Canadian citizens and in 1981 he became a registered member of the Association of Professional Engineers of New Brunswick.

Having authored over 300 papers, there is simply not enough time here to go into details about Petr's prolific professional life. However, I do want to take the time to mention some of the more important highlights of his career, including other recognitions of his achievements. In typical Canadian fashion, most of these have come from outside Canada. One of the first of Petr's important contributions to geodesy, and the field of numerical analysis in general, was his Ph.D.

dissertation on the development of least squares spectral analysis for unevenly spaced data series. First published in 1969, he is still gaining wide recognition for this work, as in the second edition of Press et al.'s popular reference book "Numerical Recipes." No less impressive are Petr's other technical achievements. For example, he completed the first map of contemporary vertical crustal movements for Canada based on geodetic data. More recently he has also developed new techniques for four dimensional positioning and geoid determination.

In recognition of his scientific achievements, Petr became one of only a handful of geodesists worldwide to receive a Senior Visiting Scientist award from the US Academy of Science. He used the award to spend time during the late 1970's at the National Geodesy Survey, where he worked on, among other things, tidal corrections to geodetic quantities, sea-tide loading, correlations in levelling, and his book "Geodesy: The Concepts" (see below). Since the mid-1980's, Petr has received a number of other prestigious awards and recognitions. For example, in 1986 he was invited to South Africa in 1986 on a research fellowship to report on the state of geodesy in that country. The next year he received a fellowship of the AGU -- being one of only 15 geodesists (only 5 foreigners) to receive the honour. Not to be outdone by the Americans, the Alexander von Humboldt Foundation of Germany awarded him with the Distinguished Senior Scientist award. This is a particularly significant honour, as he is the first and only such Canadian to receive this prestigious award, which is used to foster scientific cooperation with German scientists. Most recently, in 1993, Petr earned his Doctoral of Science degree from the Czech Academy of Sciences, based mainly on his significant technical papers in geodesy and numerical analysis. For those not familiar with the D.Sc., it is a state degree that, in many European countries including the Czech Republic, is awarded for internationally pioneering research. Petr has also attracted more than a few millions of dollars in grants and contracts, most going to support his students, research assistants and visiting colleagues. As one of the research staff in the late 1980's, I can probably account for a couple of hundred thousand of this myself.

Petr's career is not only remarkable for his research achievements, but also for his contributions to education. Almost 40 graduate students from all five continents and numerous cultural backgrounds have had the benefit of his tutelage, including yours truly. All would testify to his ability to instill clear thinking, originality and a hard work ethic. This he constantly demonstrated to all by example. In recognition of his teaching abilities, Petr has received more than one UNB Merit Award for excellence in teaching and research. Petr has also been very generous to all this students and colleagues, both professionally and personally. I think Galo Carrera summed this up nicely in his nomination letter: "When economic factors became a barrier to prevent a student from completing a program, he always found a way, sometimes even out of his own pocket, to assist in what he calls 'wise intellectual investments.' He always made sure that a scientific mind was not wasted due to lack of opportunities."

In addition to his numerous lecture notes, Petr's greatest contribution to education is undoubtedly his text book, "Geodesy: The Concepts." Despite being more than 14 years old now, it is still the most comprehensive book on geodesy and is the standard text used for both undergraduate and graduate courses in geodesy throughout the world. This being reinforced by the fact that it has

been translated into several different languages. I should also make a special note of the 1980's when Petr was a full professor not only at UNB, but also at the University of Toronto in Survey Science. Moreover, at the U of T he held cross-appointments in Survey Science, Civil Engineering and Geophysics. During this period he looked after graduate students at both the U of T and UNB. It was during his time in Toronto that he took myself and others under his wing as we began our careers in geodesy.

Finally, many senior members of the CGU know Petr from another side -- that of his significant contributions to the independence of the Union itself. Not only did he serve as president from 1987 to 1989, but it was primarily his determination and political skill that revitalized the Union in the late 1980's into the independent society it is today, representing geophysicists of all "stripes." I think most at that time would agree that this would not likely have happened without Petr's commitment and efforts. It was also his idea to hold the 1987 IUGG assembly in Vancouver on the 30th anniversary of the last time it was held in Canada (Toronto). Although the Americans were the first to submit their invitation to hold the assembly, it was again Petr's political skill as part of a 3-member Canadian delegation that convinced them to recall their invitation so that Canada could host it in Vancouver.

After all these achievements, international awards and recognition, it's now time we officially honour him ourselves. My co-sponsors Rod Blais, Adrian Camfield, Galo Carrera, Spiros Pagiatakis, Doug Smylie, David Strangway, and I are proud to nominate Petr Vanicek as the first geodesist to receive the J. Tuzo Wilson Medal. Congratulations Petr, you certainly deserve it!

Michael R. Craymer

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### **RESPONSE PETR VANICEK**

Thank you, Mike, for your very generous words. It is indeed a very great honour for me to have been selected the J. Tuzo Wilson medalist for 1996, and I must thank the Canadian Geophysical Union Awards Committee for judging me a worthy recipient. I remember clearly Tuzo Wilson's acceptance speech 18 years ago, when he was presented with the first Wilson medal. He said, and I quote from memory: "I have been introduced here as one of the members of the first graduating class [in geophysics at the Trinity College, Toronto in 1930]. This is not quite correct; I was the graduating class." He must have felt pretty lonely, pro-fessionally speaking, after his graduation, and I could sympathize with him entirely, as I found myself in a very similar situation when I came to Canada some 27 years ago. Geodesists were in a very short supply in Canada at that time and consequently, the "name recognition" for geodesy was very low; whenever I was asked to declare my profession, the best reaction I could hope for was: "ah, a geologist, eh". Even the late Director General of the late Surveys and Mapping Branch of the late Department of Energy, Mines and Resources, my first boss in Canada, who was supposed to know all about geodesy, called us geodesists "the keepers of the grid."

Moreover, to most geophysicists, we, the geodesists, are too superficial (meaning interested only



in the surface of the Earth). True, and we are also usually completely ignorant of things geological as well as physical. We do not use any "dancing elephants" to chart the lithosphere, we do not argue convincingly that the Earth creeps at depth, we do not solve problems that give infinitely many solutions. Surely, to those who do, we must appear somewhat benign, dull, and nit-picking in our eternal hunt for the last millimetre. Our professional standing in Canada has much improved, however, during the past few decades, at least as far as our numbers are concerned and as far as international recognition goes. And it is really on behalf of this new generation of Canadian geodesists, who have brought this improvement about, that I accept the medal, with great pride and trepidation.

As CGU has played a significant role in my professional development, it would be impossible for me to resist this occasion to cast a look back at the history of this august organization. CGU was inaugurated in 1973 - I hope I have got the year right - after the dissolution of National Research Council Associate Committee on Geodesy and Geophysics. No more public funds would be made available for any geophysical/geodetic communion, and we had to start looking after our own needs by ourselves. The CGU was then conceived, first as a joint division of the Geological Association of Canada and the Canadian Association of Physicists. This scheme did not sit well with some of us, who felt we were neither geologists nor physicists. Yet, most of us were convinced that the only promising future for CGU was in attracting other geophysical families to join with us to build a stronger geophysical tribe. The only solution to this dilemma that we could think of was to become independent while maintaining strong ties with our two adoptive "parent" associations. An amicable separation was then negotiated, and CGU became independent at the tender age of 15.

Shortly after the proclamation of independence, the hydrologists joined CGU to become a very active and involved arm of the Union. While this is very gratifying, CGU should not stop there; we should continue working hard to attract other Canadian geophysicists, fluid, applied, fiery, geometrical, whatever their stripe happens to be, into our Union. At the same time, we have to compete with our bigger brotherly organizations, the American Geophysical Union and the European Geophysical Society, for the loyalty of Canadian geophysicists. This, by itself is a daunting task but I am hopeful that with so much brain power and good will assembled within CGU, we can find a satisfactory solution.

I wish to end by thanking my friends, Rod Blais, Galo Carrera, Adrian Camfield, Alfred Kleusberg, Richard Langley, Spiros Pagiatakis, Doug Smiley, David Strangway, and of course Mike Craymer once again, for thinking of me at the time of nomination.

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## **1997 CGU ANNUAL MEETING 4 - 8 MAY 1997**

**BANFF CONVERENCE CENTRE Banff, Alberta**

For Electronic updates, see:

WEB PAGE: <http://www.geo.ucalgary.ca/~wu/cguconf.html> Gopher Hole: [gopher.ucalgary.ca](http://gopher.ucalgary.ca)



E-mail enquiries/Abstracts: [cguconf@acs.ucalgary.ca](mailto:cguconf@acs.ucalgary.ca)

### **Outline of Scientific Program**

Sunday May 4 13:00 CGU Executive Committee Meeting  
19:00 Icebreaker Reception

Monday May 5 09:00 Simultaneous Technical Sessions  
14:00 Presidential Plenary Session  
17:00 Annual General Meeting (free beer!)

Tuesday May 6 09:00 Simultaneous Technical Sessions  
13:00 Simultaneous Technical Sessions  
19:00 Eastern/Western Snow Barbeque

Wednesday May 7 09:00 Simultaneous Technical Sessions  
13:00 Simultaneous Technical Sessions  
19:00 CGU Annual Awards Banquet - Presentation on Logan Expedition

Thursday May 8 09:00 Simultaneous Technical Sessions  
11:30 Field Trip to Columbia Icefield  
13:00 Field Trip to Grassi Lakes/Kananaskis

### **Other meetings of Interest**

Jan. 20-22, 1977: 1977 Current Activities Forum - The Geological Survey of Canada -Ottawa, Canada Contact: D. Turner at e-mail address, [turner@gsc.NRCan.gc.ca](mailto:turner@gsc.NRCan.gc.ca)

Mar. 23-27, 1997: European Union of Geosciences 9th Biennial Meeting, Strasbourg, France Contact web page, <http://sparc.ipgp.jussieu.fr/EUG/>

April 21-25, 1997: European Geophysical Society, XXII General Assembly, Vienna, Austria Contact web page, <http://www/mpae.gwdg.de/EGS/EGS.html>

May 19-21, 1997: Geological Association of Canada/ Mineralogical Association of Canada Annual Meeting, Ottawa, Canada Contact web page, <http://www.NRCan.gc.ca/~ottawa97>

July 14-18, 1997: Isotope Hydrology Meeting - CHU-HS - Saskatoon, Canada Contact: J. Gibson at e-mail address [gibson@nhrisv.nhrc.sk.ec.ca](mailto:gibson@nhrisv.nhrc.sk.ec.ca)

Sept. 24-26, 1997: 9th River Ice Workshop -CHU-HS Committee on River Ice Processes and the Environment - Fredericton, Canada Contact: B. Burrell at e-mai address [brianb@gov.nb.ca](mailto:brianb@gov.nb.ca)

### **1997 CGU Student Travel Assistance Awards**

A small fund is available to assist students travelling to the CGU 1997 Annual Meeting in Banff.

Preference will be given to students from Atlantic, Eastern and Northern Canada. To be eligible, a student must be a CGU member and first author and presenter of either an oral or poster contribution. Applications for travel support should be in the form of a brief letter addressed to the CGU Awards Committee, chaired by Ted Glenn, and must accompany the Abstract submitted to organizing committee.

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## CANADIAN GEOPHYSICAL UNION - HYDROLOGY SECTION (CGU-HS)

Established in 1993, the CGU-HS brings together scientists from all branches of hydrology. Its aims and objectives are to:

- promote hydrology as a geophysical science,
- advance the understanding and application of hydrology and related sciences,
- initiate and participate in research and education programs in hydrology, promote national and international cooperation among scientific and engineering organizations working in hydrology, and
- disseminate research results and knowledge to the public through scientific discussion, meetings and conferences, publications and other means of information and technology transfer.

The CGU-Hydrology Section also awards an annual student prize, the "D.M. Gray Student Paper Award in Hydrology". Details can be obtained through the CGU-HS secretariat at the address noted below.

The current **CGU-Hydrology Section Executive** includes:

Dr. Terry Prowse, President

Dr. Scott Munro, Vice-President

Dr. Philip Marsh, Secretary/Treasurer

Dr. Ming-Ko Woo, Member at Large

Dr. Jean Stein, Member at Large

### **CGU-HS Secretariat**

c/o National Hydrology Research Institute

Saskatoon, Saskatchewan

Canada S7N 3H5

phone (306) 975-6299, fax (306) 975-5143

E-mail: [cgu\\_hs@nrhisv.nhrc.sk.ec.gc.ca](mailto:cgu_hs@nrhisv.nhrc.sk.ec.gc.ca)

The Hydrology Section also acts as the umbrella organization for two committees: the CGU-HS IAHS Nominating Committee and the CGU-HS Committee on River Ice Processes and the Environment.

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## **CGU-HS Canadian National Committee for IAHS (interim)**

An interim Canadian National Committee for IAHS has been established comprised of the following six members:

1. The President of the Canadian Meteorological and Oceanographic Society, or her/his designate
2. The President of the Canadian Water Resources Association, or her/his designate
3. The President of the Canadian Chapter of the International Association of Hydrogeologists, or her/his designate
4. The President of the CGU-Hydrology Section, or her/his designate,
5. Two other members from the CGU-Hydrology Section membership at large selected by the President of CGU-HS.

These latter positions are currently filled by

- a) Dr. Don Gray, University of Saskatchewan, who also acts as the Chair of the interim CNC/IAHS, and
- b) Dr. H. Gerry Jones, INRS-EAU, the current Canadian National Representative to IAHS.

The main responsibility of the committee is to appoint two National Representatives for the International Association of Hydrological Sciences (IAHS) of the CNC/IUGG (Canadian National Committee for the International Union of Geodesy and Geophysics). Most member countries of IUGG usually have a National Committee for IAHS and it is through this body that official contact with IAHS is maintained. The current proposal of the interim CNC/IAHS is to establish four-year terms of office for the two Canadian National Representatives. To ensure continuity, there should be a Junior and Senior Representative with a two-year offset in their appointments. Hence, a new representative would be appointed at each IAHS General Assembly (held in conjunction with the IUGG General Assembly every four years) and at each IAHS Scientific Assembly (held mid-term between IUGG General Assemblies). It is also proposed that the Senior Representative would be the official voting delegate for Canada and act as Chair of the CNC/IAHS. The Junior Representative would act as the Secretary. Final decisions regarding this arrangement will be the responsibility of the interim CNC/IAHS.

A second responsibility of the CNC/IAHS is to nominate officers and appoint Canadian representatives for the various IAHS Commission and Committees. These presently include:

- The International Commission on Surface Water (ICSW)
- The International Commission on Groundwater (ICGW)
- The International Commission on Continental Erosion (ICCE)
- The International Commission on Snow and Ice (ICSI)
- The International Commission on Water Quality (ICWQ)
- The International Commission on Water Resources Systems (ICWRS)
- The International Committee on Atmosphere-Soil -Vegetation Relations (ICASVR)

- The International Committee on Remote Sensing and Data Transmission (ICRS DT)
  - The International Committee on Tracers (ICT)
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## **CGU-HS Committee on River Ice Processes and the Environment**

### **Background**

Ice processes play a dominant role in the hydrologic regime of Canadian rivers and are intimately related to the life cycle of many aquatic, terrestrial, and avian species. The most serious impacts of river ice occur during ice-jam flooding, when loss of property and human life may be experienced. Evacuations, and even relocations, of entire communities are often prompted by ice jams. For Canada, it has been estimated that such events are responsible for annual damages of about sixty million dollars. A far greater cost is attributed to missed hydro-power generation opportunities during the winter, owing to constraints imposed by river ice and the lack of pertinent knowledge to deal with them.

Aquatic ecosystems have, over time, adapted to the prevailing ice regime of any one river and changes to this regime can have serious ecological impacts. A capability to anticipate such changes is essential in dealing with the consequences of northern development, hydro-power generation, regulated effluents or accidental spills, and global warming.

Despite the socio-economic and environmental importance of river ice processes in many parts of the globe, river ice science is at an early phase of development, and many ice processes are only vaguely understood. The basic aim of the Canadian Committee on River Ice Processes and the Environment is to help bridge this gap, as elaborated next.

### **Objectives and Activities**

The Committee on River Ice Processes and the Environment derives from a Working Group that was established in 1975 by the Associate Committee on Hydrology (ACH), itself funded by the National Research Council of Canada (NRCC). This working group evolved into a permanent Subcommittee of ACH in 1981. Severe budget cuts at NRCC forced the discontinuation of the associate committees in the early nineties. In 1995, the former River Ice Subcommittee of ACH joined the Canadian Geophysical Union, as a Committee of the Hydrology Section.

Initially, the Committee's work focussed on the hydraulic aspects of river ice phenomena, as a means of elucidating the effects of the ice cover on flow characteristics. This scope was gradually expanded to include additional issues of concern, such as ice formation, ice jams, winter operation of hydro-plants, environmental aspects of river ice, and climatic variability and change.

The main objectives of the Committee are:

- to identify specific high-priority topics for research and development and promote the undertaking of relevant research programs;

- to facilitate information dissemination and exchange of ideas among practitioners, researchers, and resource managers; and
- to encourage the incorporation of pertinent lectures or courses in undergraduate and graduate studies at Canadian Colleges and Universities.

One of the main Committee activities is the sponsorship of workshops and short courses, and publication of Proceedings. The first river ice workshop was held at Burlington, Ont., in 1980, and the eighth at Kamloops, B.C., in 1995. Fredericton, N.B., will be the site of the forthcoming workshop, as indicated later. Another ongoing activity is the initiation and leadership of Task Forces to work on specific problems and publish their findings. From time to time, the status of knowledge on particular topics is reviewed and research needs are identified. Liaison with river ice work abroad is maintained through formal and informal links.

In 1992, the Committee established the Gerard Medal, to honour and remember the many contributions to river ice science by the late Professor Robert (Larry) Gerard who passed away in 1991. The Gerard Medal is awarded biennially to the author(s) of the best paper presented at a River Ice Workshop.

## Membership

D. Andres (Secretary), S. Beltaos (Chair), R. Boals, B. Burrell, R. Carson, M. Demuth, N. Marcotte, R. Raban; emeritus members: K. Davar (past Chair), T. Lavender, B. Michel, G. Tsang; liaison members: T. Prowse (Hydrology Section), S. Wilkins (British Columbia), J. Wuebben (United States).

## Publications

Workshop Proceedings: 1980, 1982, 1984, 1986, 1988, 1991, 1993, 1995 (in press).

State-of-the-art reports/monographs/books:

- *Hydraulic resistance of ice covered rivers* (a series of papers dealing with the hydraulic resistance of different types of ice cover, published in: Proceedings, Canadian Hydrology Symposium 1979).
- *Frazil and anchor ice*, a monograph (published by National Research Council of Canada, Ottawa, 1982, written by G. Tsang).
- *Optimum operation of hydro-electric plants during the ice regime of rivers*, a Canadian experience (published by National Research Council of Canada, Ottawa, 1990, written by Task Force on winter operation of hydro-plants, co-ordinated by T. Wigle).
- *River Ice Jams: field studies and research needs* (published by National Hydrology Research Institute, Saskatoon, Science Report No. 2, 1990, written by S. Beltaos, R. Gerard, S. Petryk, T. Prowse).
- *Environmental aspects of river ice* (published by National Hydrology Research Institute, Saskatoon, Science Report No. 5, 1993, written by Task Force on Environmental Aspects of River Ice, edited by T.D. Prowse and N.C. Gridley).

- *River ice jams* (published by Water Resources Publications, Highlands Ranch, Colorado, 1995, edited by S. Beltaos).
- *Primer on Hydraulics of ice covered rivers* (jointly published by the Committee and Environment Canada, 1996, Fredericton, edited by K.S. Davar, S. Beltaos, B. Pratte)

## **Inquiries**

Please address inquiries to:

Dr. Spyros Beltaos, Chair, Committee on River Ice Processes and the Environment (CGU-HS),  
c/o Aquatic Ecosystem Conservation Branch,  
National Water Research Institute,  
867 Lakeshore Road,  
Burlington, ON, L7R 4A6.  
telephone, 905-336-4898;  
fax:, 905-336-4420;  
email <[spyros.beltaos@cciw.ca](mailto:spyros.beltaos@cciw.ca)>

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## **CGU-HS ANNUAL MEETING REPORTS**

### **1995 Publications of CGU-Hydrology Section Meeting, Banff**

The 1995 CGU-HS meeting included a special international GEWEX (Global Energy and Water Cycle Experiment) workshop. The objectives were to review the current state of knowledge of cold-season region hydrology and land-atmosphere interactions; identify and address the most critical problems facing the modelling community; and provide recommendations on how the GEWEX Continental-scale International Project (GCIP) and the Canadian Mackenzie GEWEX Study (MAGS) can contribute to solving these problems. Key recommendations regarding hydro-meteorological data sets, snow and soil moisture modelling, hydrologic and atmospheric modelling, and remote sensing are summarized in the CGU newsletter Elements 13(2), Nov. 1, 1995. A summary report of the meeting has also been published by the International GEWEX Project Office (IGP Publication Series No. 15). A special issue of the inter-national journal Hydrological Processes (October 1996) contains selected papers from the GEWEX workshop as well as others presented in the general CGU-HS meeting that dealt with a wider range of hydrologic topics.

The 1995 recipient of the D.M. Gray Student Paper Award in Hydrology was Mr. John Gibson, Department of Earth Sciences, University of Waterloo, for his paper entitled "Development and Validation of an Isotopic Method for Estimation of Lake Evaporation" and authored by J.J. Gibson, T.D. Prowse and T.W.D. Edwards.

### **1996 Summary of CGU-HS Section Meeting, Banff**

The 1996 CGU-HS meeting focussed on a special theme of hydro-ecology and included two special workshops reviewing the scientific results from Canada's Arctic Environmental



Strategy-Water Program and the Northern Rivers Basin Study. An additional workshop commemorating the 30th anniversary of the establishment of research operations on Peyto Glacier in Banff National Park was also held. Selected papers from the 1996 meeting will be published in an upcoming issue of Hydrological Processes.

The 1996 recipient of the D.M. Gray Student Paper Award in Hydrology was Ms. Jane Rae, Department of Geophysics and Astronomy, University of British Columbia, for her paper entitled "Determining Hydrogeologic Length Scales for Ground Penetrating Radar Data" and authored by J. Rea and R. Knight.

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## **CGU-HS UPCOMING MEETINGS**

### **1. CGU-HS Annual Meeting, Banff, 04-08 May 1997/ Rencontre annuelle de la Section UGC-Hydrologie (UGC-SH), Banff, 4-8 Mai, 1997**

The 1997 CGU-HS meeting will be held in conjunction with the Eastern and Western Snow Conferences in Banff, Alberta, Canada from May 04 to 08, 1997. The scientific program will be open to all aspects of hydrology but a special focus will be placed on theoretical, empirical and operational studies related to snow and ice.

*La rencontre UGC-SH 1997 va être tenue conjointement avec les Colloques sur la Neige Régions Est (CNE) et Ouest (CNO) à Banff, Alberta, Canada du 4 au 8 mai 1997. Le programme scientifique va être ouvert à tous les aspects de l'hydrologie, mais un focus spécial portera sur les études théoriques, empiriques et opérationnelles reliées à la neige et à la glace.*

### **Western Snow Conference (WSC)/Colloque sur la Neige Région Ouest (CNO)**

The origin of the WSC stems from the pioneering work in snow hydrology and runoff forecasting of Dr. James E. Church and has developed into a joint U.S./Canadian organization. Over the last 65 years, the WSC has provided an international forum "for individuals and organizations to share scientific, management, and socio-political information on snow and runoff from any viewpoint and to advance the Snow and Hydrologic Sciences."

*L'origine du CNO provient du travail de pionnier dans le domaine de l'hydrologie de la neige et de la prédiction de l'écoulement effectué par le Dr. James E. Church et s'est développé en une organisation conjointe U.S./Canada. Le CNO a servi de forum international depuis 65 ans aux individus et organisations pour échanger de l'information scientifique, de la gestion et socio-politique sur la neige et l'écoulement à partir de n'importe quel point de vue et pour avancer les sciences sur la neige et sur l'hydrologie.*

### **Eastern Snow Conference/Colloque sur la Neige Région Est (CNE)**

The Eastern Snow Conference is a joint U.S./Canadian organization which was founded in the 1940's. It is an association of people interested in research and applied aspects of the study of ice

in all its forms, especially snow. The members of the ESC form a diverse group interested in a wide range of topics. This diversity is reflected at annual ESC meetings where sessions have included themes such as snow and ice ecology, the remote sensing of snow and ice, snow and buildings, river ice, glaciers, ship icing, lake-effect storms, snow and agriculture, the measurement of snow and ice, and the role of snow and ice in hydro-electric production. The ESC is committed to encouraging the work of students and promoting the fellowship of young and old snow workers alike. The CGU Hydrology Section and the Western and Eastern Snow Conferences invite you to Banff to exchange information and to discuss the most recent advances in hydrological science and related management/operational issues.

*Le CNE est en une organisation conjointe U.S./Canada qui a été fondée dans les années 40. C'est une association de personnes intéressées dans la recherche et les aspects appliqués de l'étude de la glace sous toutes ses formes et spécialement la neige. Les membres du CNE forment un groupe diversifié intéressé à une grande variété de sujets. Cette diversité se reflète aux rencontres annuelles du CNE où les sessions ont inclus des thèmes tels que l'écologie de la neige et de la glace, la neige et les constructions, la glace et les rivières, les glaciers, la glace sur les bateaux, les effets des lacs sur les tempêtes, la neige et l'agriculture, la mesure de la neige et de la glace, et le rôle de la neige et de la glace sur la production hydro-électrique. Le CNE est dédié à l'encouragement de travaux d'étudiants et à la promotion de la camaraderie entre les jeunes et les travailleurs d'expérience sur la neige.*

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## **SCIENTIFIC PROGRAM/PROGRAMME SCIENTIFIQUE**

The scientific program will be developed as a fully integrated, joint meeting with the following themes.

*Le programme scientifique va être développé comme une rencontre conjointe et complètement intégrée sur les thèmes suivants.*

### **1997 CGU-HS themes/Thèmes UGC-SH 1997**

The Scientific Program of the Hydrology Section is open to all areas of scientific hydrology. Papers are invited on any aspect of hydrology, and empirical, theoretical, and modelling approaches are welcomed. Six areas of particular interest include:

- Forest Hydrology
- Glacier Hydrology
- Groundwater Hydrology
- Hydroclimatology
- Wetland Hydrology

Due to the joint meeting with the WSC and ESC, papers dealing with all aspects of snow and ice are especially welcome.

*Le programme scientifique de la section Hydrologie est ouverte à l'ensemble des domaines des sciences hydrologiques. Les propositions peuvent porter sur tous les aspects de l'hydrologie, et celles portant sur les approches de modélisation, approches empiriques et théoriques sont les bienvenues. Six domaines sont d'un intérêt particulier et incluent:*

- Hydrologie Forestière
- Hydrologie des Glaciers
- Hydrologie Souterraine
- Hydroclimatologie
- Hydrologie des Tourbières.
- *Étant donné que notre rencontre est conjointe avec le CNO et le CNE, les communications touchant tous les aspects de la neige et de la glace sont particulièrement appréciées.*

### **WSC AND ESC themes/Thèmes CNO et CNE**

The Western and Eastern Snow Conferences are interested in all aspects of snow and ice. For the 1997 meeting, the special theme topics include:

- Climate change and snow & ice in alpine areas - modelling, detection, and management issues
- Snow in the boreal forest-process modelling, ecology, chemistry, and management issues

*Les Colloques sur la Neige Régions Ouest et Est sont intéressées à tous les aspects de la neige et de la glace. Pour la rencontre de 1997, les sujets spéciaux incluent:*

- Changements climatiques et la neige & glace dans les aires alpines -simulation, d,tection et questions de gestion
- Neige dans la forêt boréale
- -modélisation de processus, écologie, chimie et questions de gestion.

### **Guest Speaker/Conférencier invité**

As part of the snow theme of the 1997 meeting, Dr. S. C. Colbeck of the Cold Regions Research and Engineering Laboratory will be presenting an invited lecture at the CGU Presidents Plenary Session.

*Comme partie intégrante du thème sur la neige de la rencontre de 1997, le Dr. S. C. Colbeck du Cold Regions Research and Engineering Laboratory des États-Unis va effectuer une présentation comme conférencier invité à la session plénière des présidents de l'UGC.*

### **Call for Papers/Appel des communications**

You are invited to submit an abstract for an oral or poster presentation. An extended abstract of 150-300 words should be submitted by January 15, 1997 to the CGU-HS Secretariat noted above. Authors will be notified of acceptance of their abstracts by February 1, 1997.

*Vous êtes invités à soumettre un résumé pour une présentation orale ou par affiche au secrétariat de la Section UGC-Hydrologie. Un résumé d'une longueur de 150-300 mots devrait être soumis d'ici le 15 janvier 1997. Les auteurs seront avertis de l'acceptation de leur résumé d'ici le 1er février 1997.*

## **Publications/Publications**

All abstracts are published in the CGU proceedings-program volume. In addition, authors have the option of submitting for possible journal publication in Hydrological Processes and snow/ice papers submitted at the conference will be published in the joint WSC/ESC Proceedings.

*Tous les résumés sont publiés dans le volume du programme et comptes-rendus de l'UGC. De plus les auteurs ont l'option de soumettre pour publication dans la revue "Hydrological Processes" et les articles sur la neige/glace soumis à la rencontre seront publiés dans les comptes-rendus conjoints de CNO/CNE.*

## **Time Table Deadlines/Cédule de dates limites**

Abstract submission: .....Jan.15, 1997  
 Notification to authors .....Feb.1, 1997  
 ESC Student paper .....Feb 28, 1997  
 5 page CGU-HS Student Paper .....April 10, 1997  
 Papers to WSC/ESC Proceedings .....at meeting  
 Papers for Journal Publication .....at meeting  
 Meeting/Workshop in Banff.....May 4-8, 1997

*Soumission des résumés.....Jan.15,1997*  
*Notification aux auteurs .....Fév.1, 1997*  
*Article étudiant pour le CNE .....Fév.28, 1997*  
*5 pages pour l'article étudiant UGC-SH .....Avril 10, 1997*  
*Article final pour les comptes-rendus CNO/CNE.....à la rencontre*  
*Articles pour publication dans une revue.....à la rencontre*  
*Rencontre/Atelier de travail à Banff .....4-8 mai 1997*

## **Joint Scientific Program Committee**

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Geoff Kite, Western Snow Conference Program Chair  
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 kiteg@nrhisv.nhrc.sk.ec.gc.ca

Robert Davis, Eastern Snow Conference

Program Chair Tel: 603-646-4219 Fax: 603-646-4397  
email: bert@hanover-crrel.army.mil

### ***Comité conjoint du programme scientifique***

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*Robert Davis, Président du programme CNE*  
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email: bert@hanover-crrel.army.mil

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### **Awards/Prix**

#### **CGU-HS Award/Prix de l'UGC-SH**

**D.M. Gray Student Paper Award in Hydrology:** To be eligible for the 1997 award, a student must submit a 5 page paper by April 10 to the CGU-HS Secretariat. The paper should reflect the content of the presentation at the Annual Meeting. Co-authorship is allowed but the student has to be the first author and presenter. The criteria for assessment include originality, significance of the results, and quality of presentation. The award will be announced and the medal and \$500 prize presented at the CGU banquet.

*Le prix D.M. Gray pour un article étudiant en Hydrologie: Pour être éligible pour le prix 1997, un étudiant doit soumettre un article de 5 pages d'ici le 5 avril au Secrétariat de la Section UGC-Hydrologie. L'article doit refléter le contenu de la présentation à la rencontre annuelle. Un co-auteur est admis mais l'étudiant doit être premier auteur et conférencier. Les critères d'évaluation incluent l'originalité, l'importance des résultats et la qualité de la présentation. Le prix sera annoncé et la médaille et un montant de 500\$ seront attribués au banquet de l'UGC.*

#### **Western Snow Conference Awards/Prix du Colloque sur la Neige Région Ouest**

**Best Papers:** awarded annually to the best oral and the best poster papers presented at the Conference. These will be selected by the WSC Awards Committee and presented at the annual meeting.

**Dr. G. E. Church Award:** presented to an outstanding high school science student within the WSC North Continental area.

***Meilleurs Articles:** attribués annuellement aux meilleures communications orales et affiches présentées à la rencontre. Celles-ci vont être sélectionnées par le Comité des Prix CNO et octroyées à la rencontre annuelle.*

***Le prix Dr. G.E.Church:** attribué à un étudiant exceptionnel du niveau secondaire à l'intérieur de la région Continental Nord CNO.*

### **Eastern Snow Conference Awards/Prix du Colloque sur la Neige Région Est**

**Best Papers:** are acknowledged in the ESC Proceedings by the ESC President to recognize the best presented and substantive oral and poster paper.

**Student Award:** recognizes the work of student snow and ice workers who have contributed a written paper to the annual ESC. Associated with this award is the Wiesnet Medal, named after Don Wiesnet, a long-standing ESC member and advocate of student participation. The winner receives a \$250 cash prize and up to \$500 towards travel expenses to attend the conference. The first runner-up receives \$100.00 cash prize.

For information, contact:

Dr. J. Stein, Chair Eastern Snow Conference Research Committee

Tel: 418-654-3834 Fax:418-654-2600

email: [steinj@inrs-eau.quebec.ca](mailto:steinj@inrs-eau.quebec.ca)

***Meilleurs Articles:** sont reconnus dans les comptes-rendus du CNE par le président du CNE pour reconnaître la plus substantielle et la meilleure communication orale et affiche présentées.*

***Prix étudiant:** reconnaît le travail d'un étudiant sur la neige et la glace qui a contribué à un article écrit à la rencontre annuelle du CNE. Associé avec ce prix est la médaille Wiesneté nommé d'après Don Wiesneté un membre de longue date et un plaideur pour la participation des étudiants. Le gagnant reçoit 250\$ comptant comme prix et jusqu'à 500\$ pour payer les dépenses de voyage pour participer à la rencontre. Le second reçoit 100\$ comptant comme prix. Pour information, contactez: Dr. Jean Stein, Président du Comité sur la Recherche du CNE, Tel: 418-654-3834, Fax: 418-654-2600 [email: steinj@inrs-eau.quebec.ca](mailto:steinj@inrs-eau.quebec.ca)*

## **2. CGU-HS sponsored, Isotope Hydrology Meeting, Saskatoon, 14-18 July 1997**

The National Hydrology Research Institute (NHRI) will be hosting an international symposium and workshop entitled "Application of Stable Isotopes in Water Balance Studies" scheduled for 14-18 July 1997 in Saskatoon, Saskatchewan. The meeting, co-sponsored by the CGU-Hydrology Section, the Mackenzie GEWEX Study and the Waterloo Centre for Groundwater Research, is intended as a forum for interaction between "isotope specialists" and "hydrologists who apply isotopic tracers". The scientific program will feature keynote addresses and review articles from distinguished international isotope experts including: J. Gat, D. Yakir and X. Wang (Israel), K. Froehlich and L. Araguas (IAEA, Isotope Hydrology Section), K. Rozanski (Poland), U. Schotterer (Switzerland), W. Stichler (Germany), M. Sklash (USA) and T.



Edwards (Canada). Scientific papers are invited on all applications of stable isotopes in water balance studies including runoff generation, evapotranspiration, precipitation, atmospheric water balance, GCMs, glacial and proglacial processes, large lake processes, and paleohydrology. The meeting will feature a workshop discussion on application of isotopic tracers in large-scale studies such as GEWEX (Global Energy and Water Cycle Experiment) including current and proposed activities within MAGS (Mackenzie GEWEX Study) and BALTEX (Baltic Sea Experiment).

For more information please contact: Dr. John Gibson, NHRI, 11 Innovation Blvd., Saskatoon, Saskatchewan S7N 3H5 Canada, Phone: 306-975-5744, Fax: 306-975-5143, email: gibsonj@nhri.v.nhrc.sk.doe.ca; (as of 15/02/97 gibsonj@nhri.v.nhrc.sk.ec.gc.ca.) Registration may be limited.

### **3. CGU-HS Committee on River Ice Processes and the Environment, 9th River Ice Workshop, Fredericton, 24-26 September 1997.**

**Theme:** Hydro-Power and Ice-Covered Rivers. Topics directly related to the general theme include: design and construction considerations, ice processes in regulated rivers, operational problems and their mitigation and solution, ecology and biochemistry in reservoirs. Other topics to be considered include, but are not limited to: effects of climate change on river ice regimes, breakup forecasting, ice jams, ice forces on structures, sediment transport in ice-covered rivers, ice in estuaries.

**Paper Submission:** Those interested in presenting a paper are requested to submit an abstract of about 500 words by January 17, 1997, to Dr. Sayed Ismail, N.B. Power Commission, technical program chairperson, at email address: eismail@nbpower.com; telephone: 506-325-7816; fax: 506-325-5013. Notification of abstract acceptance will be made by February 14, 1997. Authors of accepted abstracts will be expected to submit formal papers in camera-ready format by June 13, 1997, for publication in the Workshop Proceedings.

**Short Course:** Plans are under way to organize and offer a two-day course on topics related to the hydraulics of ice covered rivers and ice mechanics, during the two days preceding the Workshop (September 22 and 23, 1997). Course content and registration fee will be determined by the Organizing Committee in the near future. For more information, contact Mr. Brian C. Burrell, as indicated below.

**Location:** Lord Beaverbrook Hotel, Fredericton, New Brunswick, Canada.

**For registration and more information:** contact Mr. Brian C. Burrell, N.B. Department of the Environment, organizing committee chairperson, email: brianb@gov.nb.ca; telephone: 506-457-4844; fax: 506-453-2390.

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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. Publication is scheduled for March and September. 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. Submissions should be made to the editor:

Dr. Gary T. Jarvis, Department of Earth and Atmospheric Science, York University, North York, Ontario, Canada, M3J 1P3. Telephone: (416) 736-2100 ext 77710; Fax: (416) 736-5817; Internet: [jarvis@mantle.eats.yorku.ca](mailto:jarvis@mantle.eats.yorku.ca).

Hydrology specific submissions may be sent to the associate editor - hydrology: Dr. Jean Stein, INRS-Eau, Universit, du Québec, Québec, Canada G1V 4C7. Telephone: (418) 654-3834; Fax, (418) 654-2600, Internet, [stein@inrs-eau.quebec.ca](mailto:stein@inrs-eau.quebec.ca)

Electronic submission in ASCII format is encouraged.