



Frozen Ground

Number 8

The News Bulletin of the International Permafrost Association

December 1990



International Permafrost Association

The International Permafrost Association was founded in 1983 and has as its objectives fostering the dissemination of knowledge concerning permafrost and promoting cooperation among persons and national or international organizations engaged in scientific investigations and engineering work on permafrost. Membership is through adhering national organizations. IPA is governed by a Council consisting of representatives from 17 countries having interests in some aspects of theoretical, basic and applied frozen ground research (includes permafrost, seasonal frost, artificial freezing and periglacial phenomena). Working Groups organize and coordinate research activities. IPA became an Affiliated Organization of the International Union of Geological Sciences in July 1989. The Association's primary responsibility is the convening of the international permafrost conferences. The first conference was held in the U.S. in 1963; the second in Yakutsk, Siberia, 1973; the third in Edmonton, Canada, 1978; the fourth in Fairbanks, Alaska, 1983; and the fifth in Trondheim, Norway, 1988. The sixth conference is planned for China in 1993. Field excursions are an integral part of each Conference, and are organized by the host country.

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Argentina	France	Poland
Belgium	Germany, Federal Republic	Sweden
Canada	Italy	Switzerland
China, People's Republic	Japan	United Kingdom
Denmark	Netherlands	USA
Finland	Norway	USSR

Cover Photograph:

The track for a railcar to transport workers to Coal Mine No. 3, Longyearbyen, Svalbard. Its use was discontinued in 1967 with the closing of the mine. Slope movement of talus and other colluvium from 1967 to 1979 had differentially displaced parts of the track about 1.5 meters. (Photograph No. 4358 by Troy L. Péwé, June 30, 1979)

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International Permafrost Association

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Frozen Ground, the News Bulletin of the International Permafrost Association (IPA), will be published semi-annually starting in 1990. The IPA is a non-governmental association of national organizations representing eighteen countries. Numbers 7 and 8 of *Frozen Ground* were prepared by Mike Clark on behalf of the IPA Editorial Committee. The success of the bulletin is entirely dependent upon the willingness of IPA participants to supply information for publication. Copy date for issue No. 9 is the end of May 1991. Please ensure that Working Groups and member country reports are submitted in good time for publication. News items for inclusion in the Miscellaneous Items section are also very welcome from any IPA participant. For copies of *Frozen Ground* please contact the appropriate individual listed on the back cover.

Issue No. 8 of *Frozen Ground* has been produced with the support of the GeoData Institute, University of Southampton, UK. The issue has been edited by Mike Clark and sub-edited by Suzanne Mitchell. Printing was courtesy of the Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, USA.

Errata:

A number of people have expressed an interest in the IPA Council photo published in issue No. 7, p. 11.

For those of you who do not recognise the faces they are as follows:

Back Row: J. Aguirre-Puente (France), Mme. A.M. Cames-Pintaux, F. Dramis, J.P. Lautridou, H. French, E.A. Koster, H. Mai, M. Clark, S. Akerman, Bill Lovell, J. Brown and N. Romanovski.

The credit for the cover photo of issue No. 7 was inadvertently omitted. The photograph was taken by Mr. Richard Lévesque, Laval University, Quebec City, Canada.

IPA & COUNCIL NEWS

Sweden is now a member of IPA following unanimous approval of Council and mail vote.

This issue of the News Bulletin contains the full text of the IPA Constitution and Bylaws (see p. 13–16).

President's Column

Peer Review

A question that arises perennially at national and international conferences (the Conferences on Permafrost are no exception) deals with the quality of papers published in the respective conference proceedings. Especially in academic circles in North America, there seems to be differences of opinion concerning the value of papers published in conference proceedings vs. those published in refereed journals. The issue boils down to peer review of papers and their acceptance for publication only after they meet established criteria.

Actually, over the years in North America, our various permafrost committees established under both the U.S. and Canadian Research Councils have exerted considerable influence in maintaining high level peer review, particularly for predominantly English language papers. All North American papers for all the past Conferences on Permafrost underwent an established peer review, each by two or more persons. The papers were then examined by editorial committees to determine if they met established criteria.

A brief historical review may be appropriate here. The First International Conference on Permafrost (US 1963) had 103 papers and was organized by the Building Research Advisory Board of the U.S. National Academy of Sciences–National Research Council. Both the Polar Research Committee and BRAB of the National Academy of Sciences were responsible for reviewing and editing papers for the Proceedings, which appeared in 1966 as NAS-NRC Publication No. 1287. Professor F.J. Sanger of Washington, D.C., was honorary Technical Advisor and translated and edited the papers of the USSR from the Russian.

The Second International Conference on Permafrost was held in Yakutsk, Siberia, USSR in 1973. Permafrost scientists and engineers of North America prepared a joint pre-conference volume of 86 papers under the Permafrost Review Committees of the National Research Councils of both Canada and U.S. After the Conference, the U.S. Planning Committee and the Canadian Organizing Committee agreed that the 222 short Soviet papers should be published in English. The two committees undertook guidance of the editing and translation of the papers, many of which were translated by personnel of the NRC of Canada and of the U.S. Army Cold Regions Research & Engineering Laboratory. F.J. Sanger served as principal technical editor. This complementary volume to the North American contribution volume was published by the U.S. National Academy of Sciences in 1978.

By the time of the Third Conference, held in Canada in 1978,

both the U.S. and Canadian National Research Councils had established active national permafrost committees. Members and associates of these two committees in North America peer reviewed and selected all of the 138 papers, including 8 invitational theme papers, of the two volumes of published proceedings.

One of the most massive efforts of presentation, publication, including peer review and selection of papers, occurred with the Fourth International Conference on Permafrost held in Fairbanks, Alaska in 1983. The U.S. Organizing Committee of the National Academy of Sciences—National Research Council established a Special Paper Review and Publications Committee of 16 persons to thoroughly conduct peer review and selection of the 341 papers and abstracts published in the abstract volume and in the two volumes of the proceedings. Each paper had at least two, and generally three, reviewers. The reviews were then studied by the Special Review and Publication Committee prior to paper selection. This special committee called on approximately 300 scientific and engineering experts in the U.S. and Canada (with a selected number from Europe) to review the papers. The names of the reviewers and the technical area under which they reviewed papers, are listed in Appendix C of the Final Proceedings volume of the Conference.

For the Proceedings of the Fifth International Conference on Permafrost held in Norway in 1988, all 288 papers underwent peer review and selection by the editorial committees, especially of U.S. and Canada. The Canadian papers underwent review and selection by the 49 reviewers in Canada. In addition, the Chinese papers underwent review by 17 reviews of Canada and U.S. The U.S. Committee for the Fifth International Conference on Permafrost used 112 reviewers to examine and select the U.S. papers. The names of these reviewers are listed on p. 8 and 9 of volume 1 of the Proceedings. The names of 48 reviewers of papers from 13 other countries are located on p. 10. Plans for the review of papers for the Sixth Conference (China, 1993) are now under consideration. At the present time, it is understood that essentially all papers will undergo peer review by scientists and engineers utilizing many reviewers.

On the national level, it would be well to note that the Fifth Canadian Permafrost Conference was held in June 1990 in Quebec City. The proceedings consisting of 56 papers were published in 1990. These papers were peer reviewed by 3 editors, 12 associate editors, and 85 internal reviewers from Canada and U.S. prior to selection and publication. The names of the editors and paper reviewers are published on p. v of the proceedings.

Troy L. Péwé, President

IPA STANDING COMMITTEES AND WORKING GROUPS

IPA Editorial Committee

The Committee's main activity since reporting in News Bulletin Number 7 (p 10–11) has been discussions on steps necessary for preparation of the circumpolar permafrost map (see IPA Council Resolution, No. 7, p. 5). Discussions to date have been primarily among U.S., Canadian and visiting Soviet specialists. In order to complete and publish the map in time for the 1993 Conference, a provisional schedule is being proposed:

Early 1991: Form an Editorial Board including a representative from IPA Working Groups on Data, Terminology and Mountain Permafrost.

Mid 1991: Agree on draft legend, base map and landscape units.

Remainder 1991: Each country assign parameters to the base map units.

Early 1992: Editorial Board and IPA Council meet at International Geographical Congress, Washington DC and complete review of map.

Late 1992–early 1993: Prepare map for printing and complete report describing map for publication in Proceedings of Sixth Conference.

Following our meetings in Quebec City last June, a number of us have been discussing the nature of the map legend. Bearing in mind that this map will draw upon existing information gathered under differing conditions, without prior standardization and differing levels of resolution, the map will need to be a generalized map. In some locations, little or no information will exist and in other areas such as along pipeline corridors large quantities of detailed data will be available. For these reasons we are proposing a generalized legend as follows:

Major Landscape Forms (1) Plains or lowlands, (2) Highlands or rolling uplands, and (3) Mountains. If an

existing physiographic base map can be found that covers the entire permafrost region of the Northern Hemisphere, those units could be used. The following information would be encoded in appropriate units:

Permafrost occurrence: (1) Continuous, (2) Generally continuous, 10–30% unfrozen, (3) Discontinuous, 30–70% unfrozen, (4) Generally free, 10–30% frozen, and (5) Isolated masses, <10%. Areas of Relict, Subsea and Alpine permafrost would also be indicated.

Permafrost conditions within each unit: (1) Permafrost thickness, (2) Active layer thickness and mean annual soil temperature, (3) Temperature at depth of zero amplitude, (4) Soil material; gravel, sand, silt, clay, peat, (5) Ground ice conditions; % ice wedges, occurrence of pingos and icings.

Related map information: Glaciers, snowline, major vegetation and climatic characteristics.

In addition, we anticipate the map will be illustrated with representative cross sections of permafrost conditions for each of the major permafrost regions.

This scheme has not been discussed in detail and should be considered very preliminary. This is an ambitious project and schedule. Although we have not agreed on who will publish the map there are good indications that the Geological Survey of Canada will assist in the cartographic preparation. Individuals who would like to offer comments on this project and the proposed legend should contact members of the IPA Editorial Committee or other Working Groups. Other international organizations are being informed of this IPA mapping project and their assistance and advice will be encouraged. The members of the Map Editorial Board will be announced in a future issue of the News Bulletin.

Report prepared by Jerry Brown,
Chairman, IPA Editorial Committee

Working Group on Present Global Change and Permafrost

As a result of the Working Group's meeting in Quebec on June 8, 1990, the following outline for a monograph on Permafrost and Climatic Change was prepared and distributed to potential authors:

1. Introduction and Natural Setting

- 1.1 Introduction: scientific assessment of the impact of climatic change on the nature and distribution of permafrost.
- 1.2 Permafrost distribution and ecological zones.

2. Climatic Change and Permafrost Distribution in the Past

- 2.1 Cryostratigraphy and its implications for former climatic changes
- 2.2 Climatic change and permafrost response: the cryogeologic record of the last five million years in Central Alaska.
- 2.3 Changes in permafrost distribution during the Late Quaternary in the USSR.
- 2.4 Rate and degree of permafrost changes in Europe during the Last Glacial.
- 2.5 Geomorphic indicators of past permafrost changes.

3. Climate-Ground Temperature-Permafrost Interactions

- 3.1 The influence of snow cover on nature and distribution of permafrost.
- 3.2 Changes in hydro(geo)logic regimes in permafrost regions due to climatic changes.
- 3.3 The influence of vegetation and organic layer on nature and distribution of permafrost: interrelationships in the "buffer layer,"

4. Permafrost Ecosystems

- 4.1 Influence of climate and CO₂ on structure and function of permafrost-dominated ecosystems.
- 4.2 Permafrost and northern peatlands: a source or a sink of greenhouse gases.

4.3 Greenhouse gas emissions from northern (Canadian) wetlands.

4.4 Hydrates in permafrost and their role in climatic change.

5. The Ground Thermal Regime of Permafrost

- 5.1 The geothermal regime of permafrost and climatic change.
- 5.2 Permafrost distribution and climate change: a comparison of model results.

6. Mountain Permafrost and Climatic Change

7. Sea Level Change and Permafrost

8. Implications of Climatic Change for Permafrost Regions

- 8.1 Natural (geomorphic) hazards related to permafrost degradation.
- 8.2 The effects of climatic change on permafrost slope processes in the Canadian Arctic.
- 8.3 The effects of climatic change on permafrost hydrology.
- 8.4 Climatic change and permafrost: impact on engineering design and construction.
- 8.5 Climatic change and permafrost: socio-economic implications.
- 8.6 Climatic change and permafrost: policy and research recommendations.

It is hoped to publish the various contributions either as a monograph by John Wiley & Sons or as a special issue of the journal *Permafrost and Periglacial Processes*, provided the normal review procedure is followed.

Any suggestions concerning the preparation of this monograph, the outline itself and/or possible contributions are most welcome. Please address all correspondence concerning the monograph to Eduard A. Koster, University of Utrecht, Department of Physical Geography, PO Box 80.155, 3508 TC Utrecht, The Netherlands. (tel. 31-30-532749 or 31-30-533786, fax. 31-30-540604.

Report on Working Group on Periglacial Environments (IPA)/Commission on Frost Action Environments (IGU)

The primary aim of the joint Working Group and Commission is to encourage and support research into the processes associated with frost action, the landforms and sediments that result, and the application of modern process studies to Quaternary periglacial palaeoenvironmental reconstruction.

Chairman: J.P. Lautridou, France
Secretary: C. Harris, UK

Reports on the Meetings

Late Vistulian and Holocene Aeolian Phenomena in Central and Northern Europe (Poznan, Poland, 14–18 May 1990). Organised by Dr. Stephan Kozarski, Adam

Mickiewicz University. 20 participants. Papers to be published in *Zeitschrift für Geomorphologie* (Suppl.).

Geocryology of Southern Africa (Petermaritzburg, South Africa, 5–17 September 1990). Joint meeting with IGCP/UNESCO Project 297. Organiser Professor C.A. Lewis. Included paper sessions and field trip to study active and relict periglacial slope deposits, patterned ground, nivation features and ice-wedge casts.

The Third Circular of the Working Group will be issued early in 1991. This contains details of all forthcoming meetings, preliminary registration forms etc. Anyone wishing to be placed on the mailing list please contact the secretary: Dr. Charles Harris, Department of Geology, University of Wales College of Cardiff, P.O. Box 914, Cardiff, CF1 3YE, United Kingdom.

NEWS FROM MEMBER COUNTRIES

Canada

The Cold Regions Geotechnology Division of the Canadian Geotechnical Society (CGS) was founded in April 1988. Since then it has grown to a membership of about 165. Shortly before this, the CGS had changed its membership requirements so as to permit scientists working in disciplines related to geotechnical engineering to join. This has resulted in a number of geologists, geophysicists and even physical geographers becoming active members of the Cold Regions Division. The first chairman of the Division was Hayley, EBA Engineering Consultants Ltd., Edmonton. Don had chaired the task group within the CGS which developed the proposal for the formation of the Cold Regions Division. The other three divisions of the CGS are the Soil Mechanics and Foundations Division, the Engineering Geology Division, and the Rock Mechanics Division.

The purpose of the Cold Regions Division is to advance the interest and coordinate activities in cold regions geotechnology among engineers, earth scientists and associated professionals in Canada. It en-

courages communication between those working in the fields of snow, ice, frozen ground and related disciplines, by sponsoring meetings and conferences, and it represents the interests of the society and of the disciplines at the national and international level. The Cold Regions Division is, in effect, the professional society for permafrost in Canada. No other society has such a direct interest in permafrost science or engineering.

The Cold Regions Division has been busy since its founding. Apart from getting itself organised, the Division sponsored a workshop in "Saline Permafrost" in October 1989; was major co-sponsor of the Fifth Canadian Permafrost Conference in June 1990 (see *Frozen Ground* # 7, July 1990); and sponsored a short session on "Ice Force Prediction" at the annual CGS conference, October 1990.

The Roger J.E. Brown Award

On an ongoing basis, the Division is now responsible for selecting the recipient of the Roger J.E. Brown

Award. This annual award, which was established in 1986 to honour the memory of this renowned Canadian permafrost scientist, is presented:

(a) to the author(s), preferably Canadian, of the best paper on permafrost science or engineering published in the Canadian Geotechnical Journal, the Canadian Journal of Earth Sciences, or the proceedings of National or International Permafrost Conferences; or

(b) to honour an individual for excellence in the field of permafrost.

The most recent recipient is G.H (Hank) Johnston, a former colleague of Roger Brown at the National Research Council of Canada. The previous recipients have been: (1986) Prof. Ross Mackay, University of British Columbia, Vancouver; (1987) Dr. Derick Nixon, (then with) Hardy Associates, Calgary; (1987) a joint award to Prof. Wayne Savigny, University of British Columbia, Vancouver, and to Prof. Norbert Morgenstern, University of Alberta, Edmonton; and (1989) Prof. Hugh French, University of Ottawa.

Executive Committee

A new executive committee for the Cold Regions Division was elected at the recent annual meeting of the CGS, held in Quebec City, October 1990. The members are:

Denis Blanchet	Canadian Marine Drilling, Calgary
Hugh French	University of Ottawa, Ottawa
Pavel Kurfurst	Geological Survey of Canada, Ottawa
Derick Nixon	Esso Resources Canada Ltd., Calgary
David Segó	University of Alberta, Edmonton

The new executive takes office on 1 January 1991, with Dave Segó as the new Chairman.

Future Activities

Future activities include co-sponsoring an ASCE Specialty Conference on Cold Regions Engineering, Hanover, USA, in February 1991, and organising a special session on "Permafrost Terrain" for the CGS annual conference in October 1991. The CGS and the Cold Regions Division are working with the National Research Council of Canada in planning an orderly devolution of some activities of the Associate Committee on Geotechnical Research (ACGR) to the CGS.

Two subcommittees of the ACGR (Permafrost and Snow and Ice) are involved in activities of particular interest to the CGS.

Canadian Ground Freezing Test Facility

Earlier this year, the Associate Committee on Geotechnical Research of the National Research Council of Canada set up a small task force to examine the feasibility of constructing and operating a ground freezing test facility in Canada. The seven-member task force has prepared a report that addresses the feasibility of such a facility. The type of experiments that could be carried out, a description of the physical plant, a management structure and possible sources of funding were all examined. The group favoured the concept of a relocatable facility that could be used to test the behaviour of natural as well as reconstituted soils. The initial push for such a facility is to learn more about frost heave effects of pipelines buried in discontinuous permafrost soils. This would be a logical extension to a research program undertaken by Carleton University, Ottawa, at Caen, France, with financial support from the Government of Canada's Program of Energy Research and Development and the Canadian petroleum industry. The new facility would be configured for frost effects research of various kinds, including behaviour of pavements and subgrades, development and testing of geophysical and geotechnical instruments, and studies of geomorphic processes in cold climates. The task force, which has recently completed its draft report, comprises.

Derick Nixon	Esso Resources Canada Ltd., Calgary (Chairman)
John Ellwood	Foothills Pipe Lines Ltd., Calgary
Chris Graham	Gulf Canada Resources, Calgary
Don Hayley	EBA Engineering Consultants Ltd., Edmonton
Alan Judge	Geological Survey of Canada, Ottawa
Bill Roggensack	Centre for Frontier Engineering Research, Edmonton
Peter Williams	Carleton University, Ottawa

Further information about the activities of the task force can be obtained from the chairman, Dr J.F. (Derick) Nixon, Esso Resources Canada Limited, 3535 Research Road NW, Calgary, Alberta, Canada, T2L 2K8.

“Geotechnical News”

News of the activities of the Canadian Geotechnical Society and its four divisions appears regularly in “Geo-technical News,” the newsletter of the North American Geotechnical Community. “Geotechnical

News” is published four times a year by BiTech Publishers Ltd., Suite 903-580 Hornby Street, Vancouver, Canada, V6C 3B6. The newsletter regularly includes articles of interest to permafrost engineering and science.

China

General Information on the National Frozen Soil Engineering Laboratory, Lanzhou Institute of Glaciology and Geocryology, Academia Sinica.

Objective

Nearly half the land of the Northern Hemisphere is frozen in the winter. The areas of northern permanently and seasonally frozen ground in China are about 20% and 50% of the total area, respectively, i.e., 75% of the total land area suffers the cyclic changes of freezing and thawing. Various kinds of engineering constructions frequently suffer damage due to the freezing and thawing of foundations. To utilize and reform frozen ground and ensure safe operation of engineering constructions in cold regions, it is necessary to understand the characteristics of frozen ground, to determine the relationship between frozen ground and engineering activities of mankind and to learn how to control adjust the various changes occurring in frozen ground.

The objective of the National Frozen Soil Engineering Laboratory (NFSEL) is to provide the place and facilities for experts, scholars and young scientists both at home and abroad to carry out the theoretical and practical research on frozen soils so as to obtain results with a high level of accuracy and to cultivate excellent scientists and engineers.

History

By ratification of the National Planning Committee and Chinese Academy of Sciences, NFSEL was begun in 1989 and will be completed at the end of 1991 with the total usable floor area of 3600 m² including 300 m² of low temperature rooms. At present, NFSEL is at the stage of construction and operation.

NSFEL was composed mainly of laboratories which originally belonged to the Division of Engineering Geocryology and the Division of Geocryological Forecast and Environment of Lanzhou Institute of

Glaciology and Geocryology, Academia Sinica. It has many experienced and qualified scientists, engineers and technicians, and some of them have visited or worked at associated laboratories of various countries such as the United States, Japan, the Soviet Union and France. For many years they not only systematically studied the physical, mechanical and thermal properties of frozen soils in the laboratory, but also undertook research work on the frozen ground problems of national major projects, such as the construction of highways, railroads and petroleum pipelines on the Qinghai—Xizang Plateau, the artificial freezing project in Lianghui coal mine and the previous study on the west line plan of the water transportation project from the south to the north. In recent years, three books and 215 articles were published, and ten of the research achievements were rewarded by the State or Chinese Academy of Sciences with 1st, 2nd, 3rd classes respectively. At the same time, the studies on strength and creep behaviour of frozen soils and water migration in freezing and frozen soils have gained new progress. The experimentation of the laboratory now is marching forward to precision, automation and regulation.

Personnel and Facilities

The total regular staff of the laboratory number 33, one full professor, 11 associate professors and senior engineers, 12 engineers including 9 postgraduate students (2 of them with Ph.D. and 7 with M.Sc.). They are working in three research groups and two technical service groups, respectively. The research groups contain 22 laboratories which have instruments and equipment valued at 4,000 yuan and will import and develop the instruments and equipment to the value of 3,800,000 yuan.

The academic committee of NFSEL consists of 18 eminent scientists and researchers both at home and abroad and will play a leading role in academic activities of the laboratory.

The Direction and Content of Research

The research direction of NFSEL is to investigate the physical, mechanical and physio-chemical processes which occur in freezing, thawing and frozen soils, as well as their mechanism and model, and their applications to the studies of engineering construction and environment.

The main contents of research are as follows:

- Moisture redistribution in freezing and thawing processes of soils, mechanism and model of water migration and ice formation;
- Solution migration on freezing and thawing processes of soils and its formation and forecast principle;
- Creep and strength theory of frozen soil, rheological mechanism and constitutive relocations;
- Developing processes, regularly modelling frost heave and heave forces;
- Regularly modelling thaw settlement and drainage consolidation;
- The influence of cryogenetic texture on the physico-mechanical properties of frozen soils and the influence of cryogenic phenomenon on engineering;
- Thermo-rheology of ice and ice-rich soils, phase transition and thawing point changes under pressure;
- Interaction between various engineering constructions and frozen ground and its influence on the environment;
- Analogue and model test for studying temperature, stress and moisture fields of various naturally and artificially frozen ground and constructions under various boundary conditions;

- Freezing and thawing processes of soils under different heat and moisture conditions and principles of heat and moisture improvement;
- Reforming and utilizing frozen ground, including principles and countermeasures for preventing structures from preventing soil freezing and use of natural cold energy;
- Improvement and development of technique and method used for frozen soil test.

Application Guide

NFSEL can accept about 20 guest researchers every year and welcomes experts, scholars, engineers and young scientists who are engaged in the study of frozen ground or engineering construction in cold regions both at home and abroad coming to work there. Application formalities are as follows:

(a) Writing a letter to NFSEL and asking them to send an application form;

(b) Completing the application and returning it to NFSEL before the end of June each year;

(c) The academic committee of NFSEL will consider all application forms and send out a notice before the end of September;

(d) If the application has been successful then the research work could be started from November each year;

(e) NFSEL will give financial support for all adopted research work (not including the international travel fee).

If you need further information about NFSEL, please write or call us using the following address: National Frozen Soil Engineering Laboratory (NFSEL), Lanzhou Institute of Glaciology and Geocryology, Academia Sinica, Lanzhou, 730000, China. Telegram: Lanzhou 0393. Phone number: 26725-399 or 389 or 472. Telex: 72008 IGGAS CN.

France

The French Permafrost Association (IPA), created on 23 March 1988, met in General Assembly in January and December 1989. The next session was held on 4 July 1990.

In France, interest in Polar Engineering and Research has increased notably in the past few years.

From the laboratories working on Physics, Geography, Geomorphology, Geology and Ethnography, several institutions have been created, gathering together different specialties:

- The "Groupement de Recherche Etudes Arctiques," principally supported by the CNRS.
- The "Club CRIN Arctiques". This is an action of the CNRS Committee of Industrial Relations, meeting Industrials, Professors and Research Workers.
- The French group for the Development of Polar Industries (DIPOL), created by several industries and having the CNRS, The Ministry of Research, the TAAF and the French Polar Expeditions as associated members.
- The Cold Regions Aspect of the French-Canadian Agreement of Cooperation.
- A program of the Ministry of Research on Civil Engineering (PROGEC). The Aspect of the Natural and Artificial Cold is notably included.
- Project MATERLOC (Chalky materials—Frost Action aspect).

Two major activities occurred:

1. Cold Regions Technologies: a bilateral workshop

(an initiative of the Canada/France Science and Technology Co-operation Program), Paris, 28–29 March, 1989.

2. Arctic Technology and Economy. International Symposium organised by the Club CRIN "Etudes Arctiques" with the participation of the "Banque Nationale de Paris," Paris, 15–17 February, 1989.

General programs are:

Ice-structures, Interaction (Ice-breakers), Freezing of Saline Solutions, Planetary Permafrost (March), Thermal Behaviours of Materials under Low Temperatures, Acoustics and Metrology of Frozen Soils, Influence of Organic Matter in Frost Susceptibility, Terre Adelie Research.

The French Permafrost Association is conducting formalities for its admission as correspondent member of the UIJA and a member of the Liaison Committee of Associations interested in Civil Engineering.

In the next congress of The International Institute of Refrigeration (Montreal, 1991), a session will be held concerning the applications of research regarding freezing on non-alimentary fields. The French Government is preparing a re-organisation of the research on Polar Regions, both Arctic and Antarctica. It wishes to establish an Agency for coordinating, evaluating and financing fundamental and applied research.

Germany

The geoscientific expedition to Liefdefjorden, Northern Spitzbergen, took place from June 1 to August 28, 1990. About 50 geographers, biologists and geologists visited the area of continuous permafrost and carried out studies concerning "Land Sea Sediment Transport in Polar Geosystems". The topics and leaders of the different working groups were:

Glacial and periglacial geomorphological processes: Glacier fluctuations and dating of moraines (G. Furrer, Zurich) Glacial geomorphology and ecology: forms, microclimate and processes (L. King, Giesen); Periglacial processes (H. Liedtke, Bochum); Geomorphological mapping, glaciology of Erikbreen (J.-L. Sollid, Oslo); Permafrost and geomorphology (G. Stäblein, Bremen).

Fluvial and marine geomorphodynamics: Fluvial geomorphodynamics (D. Barsch and R. Mäusbacher, Heidelberg); Periglacial processes and mass movement in coastal areas (K. Priestnitz, Göttingen).

Geology: Water and nutrient budget in geosystems (H. Leser, Basel); Weathering and soil development (W.-D. Blümel), Stuttgart, logistic and scientific coordinator); Vegetation studies (D. Thannheiser, Hamburg); Pollution effect: water and plants (K. Pecher, Bayreuth); Geocological satellite data (E. Parlow, Basel); Bioecology and fauna of lakes and coastal areas (G. Hartmann, Hamburg).

Geology and Geodesy: Geological mapping (P. Thiedig, Münster); Paleobotany (H.J. Schweitzer,

Bonn); Geodesy and photogrammetry (K. Brunner, München & G. Hell, Karlsruhe).

The expedition will be continued in summer 1991.

After the unification of Germany, cooperation with

permafrost and periglacial scientists of the former German Democratic Republic has started. The existing difficulties certainly will vanish after the reorganisation of most of the governmental and university institutions. Personal and institutional efforts are made for joint projects.

Japan

Dr Fujino from the Institute of Low Temperature Science and his group, conducted a field survey at Tuktoyaktuk Peninsula, near the Mackenzie Delta in August 1990. In this survey they collected frozen materials and ice samples from massive ice, which were examined for pollen analysis and isotopic contents under laboratory conditions. In the coming winter season, they will conduct another field study at the same site.

Mr Koaze and his group visited Svalbard for a permafrost study. A total of seven scientists stayed for five

weeks at Reindalen and Adventdalenin. The active ice-wedge cracking was observed by means of long term event recorders. Water samples from pingo ice were collected for chemical analysis in relation with the genesis of pingo ice.

A Japanese Antarctic Expedition will depart for Showa Station in Queen Maud Land this November. Drs Iwata and Hasashi are conducting a field survey at the Sor Rondane Mountains. The process of active periglacial phenomena will be studied in this expedition.

Norway

The Norwegian Journal *Frost i Jord* (Frost Action in Soils) will cease to be published. The first issue was published in 1970 as part of a large research programme on frost action in soils. It was later taken over by the Norwegian Committee on Permafrost. The activity of

this committee has been reduced after the V International Conference on Permafrost in Trondheim in 1988. The last volume was issued in 1988 after the IPA-Conference. We wish to thank all contributors and readers of the journal during its 20 years of life.

Switzerland

First analysis of core samples from the uppermost 20 metres (shallow core) of the active rock glacier Murtäl indicate that the permafrost contains considerable refrozen water from the earlier part of the Holocene time period and which formed from an open reservoir without contamination by modern (20th-century) water. Analyses concerning ice fabrics, isotopes (^3H and stable isotopes), chemistry (major anions and cations, dissolved gases, particulate anthropogenic species), mineralogy, pollen and gas content (^3He , noble gases) are now being extended to greater depth.

The highest—perhaps even late glacial—ages are expected at the base of the main shear zone at about 30 m depth. The blocky layer from 30 to 50 m depth may have a completely different origin than the massive near-surface ice studied so far. Material from the shallow core is still available for further tests and pilot studies, whereas the deep core must be saved for well defined studies at the most important and most appropriate depth intervals. Published results and more detailed information on availability of core material can be obtained from VAW/ETH Zurich.

A workshop was held at ETH Zurich on Alpine snow, ice and water in a warming atmosphere with contributions about climatic scenarios and the enhanced greenhouse effect (Siegenthaler, Berne); energy exchange between the atmosphere and snow/ice surfaces (Föhn, Weissfluhjoch/Davos); glaciers (Patzelt, Innsbruck and Aellen, Zurich); permafrost (Haeberli, Zurich); periglacial debris flows (Zimmerman, Zurich); and runoff (Schneider, Berne). As a consequence of atmospheric warming during the first half of the 20th

century, the lower boundary of Alpine permafrost distribution probably shifted in altitude, causing local degradation of underground ice and destabilization of formerly frozen slopes. Continued or even accelerated warming is likely to induce further retreat and degradation of permafrost in the Alps. The evolution of the coming years and decades should be documented with an appropriate monitoring programme (high-precision photogrammetry, borehole measurements, data bank containing results of geophysical soundings).

United Kingdom

The UK commitment to polar studies has been demonstrated in two main ways over the past six months. First, confirmation and clarification have been forthcoming for the establishment of a UK research base at Ny-Ålesund, Svalbard, by the Natural Environment Research Council (NERC) in conjunction with the long-standing Norwegian research interests in this area. Although relatively small in scale, this decision does represent a major advance in principle, and offers a real opportunity for the development of long-term baseline studies of the permafrost environment. The Ny-Ålesund area offers magnificent opportunities for permafrost-related studies, and is already used in this

context by Norwegian, US and French groups. One UK study scheduled to commence in June 1991 is a joint NERC-Norwegian Polar Research Institute Project on permafrost hydrology on the 1.5 km zone between the Brogger glacier and the fjord. In connection with this project and related work, two British representatives attended the Norwegian Hydrological Committee conference on Arctic Hydrology at Longyearbyen, Spitsbergen, in September 1991. The second NERC initiative of note is the funding of a Special Research Topic on tundra ecology. Inevitably, this will integrate closely with permafrost interests, with Svalbard again a probable site for some of the work.

USA

CRREL Report

The following report highlights frozen ground research and related activities at the U.S. Army's Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.

CRREL conducts research and develops design criteria for geotechnical engineering problems in both seasonal frost and permafrost regions. The laboratory is located in Hanover, NH, and employs more than 30 professional staff members in frozen ground research and related activities. While CRREL is an Army research laboratory, its geotechnical engineering program is funded by other government agencies and is focused on both the military and civilian needs of the United States.

Facilities

CRREL has many unique facilities for conducting

frozen ground research. There are 12 coldrooms devoted to preparing and testing soils and a 29,000 square foot refrigerated test facility (FERF) for full-scale tests on pavements, soils, structures and vehicles. Two servo-controlled test machines with controlled temperature chambers are available for conducting strength tests. There is specialised equipment for determining the frost susceptibility of soil, unfrozen water content by NMR spectroscopy, soil moisture characteristics and hydraulic conductivity, thaw consolidation by permeability, and non-destructive measurement of frost heave phenomena by dual gamma techniques. An instrumented test vehicle is used to measure tire traction in thawing soil. In addition, there are analytical chemistry laboratories with gas chromatographs and spectrometers to analyse soil chemistry. A scanning electron microscope is used to determine frozen soil structure.

CRREL also maintains an office in Fairbanks, Alaska. At the nearby Farmers Loop Road test facility are areas with permafrost soils. A 360 foot long tunnel in permafrost provides a unique facility for permafrost research at Fox, Alaska.

Activities

Much of CRREL's frozen ground research is focused on geotechnical engineering problems in seasonal frost regions. There is a major thrust to develop new designs and test and design procedures for pavements in seasonal frost regions. Mechanistic design procedures are being developed to replace less reliable and more costly empirical designs. The use of geotextiles, geocomposite drains and soil stabilisers to minimise the effects of frost action are also being evaluated. This work is being supported and conducted in cooperation with the FAA, FHWA and the Michigan and Minnesota Department of Transportation offices. Research into the fundamental properties and processes in freezing soils also continues. Test methods for determining the hydraulic conductivity of frozen soils are being developed. Studies also include the physical relationships that govern ice segregation in freezing soils and modelling frost heave. Research is also being conducted in the environmental area. Studies are proceeding on the effects of frost on soil liners and covers for waste disposal sites and the use of ground freezing to contain and concentrate spills and chemicals in soils.

There is a major study of off road mobility and traction in thawing soils. Studies are also being conducted on insulated foundations and buried utility lines. Thermal models are being developed to evaluate subsurface temperature and moisture regimes.

CRREL is developing design procedures for piles in permafrost. Special thermosyphons are being developed to freeze large horizontal areas. This work is directly related to the construction on permafrost of a very large Over-The-Horizon (OTH) radar antenna system. Studies are also continuing on the properties of subsea permafrost and on geophysical methods for delineating ice-bonded permafrost. CRREL is monitoring the active layer in permafrost at the Caribou-Poker Creek watershed near Fairbanks, AK, to determine the effects of different terrain characteristics on freeze and thaw depths and moisture conditions. A drilling program in northern Alaska will soon begin to obtain ground temperature data for a paleo-climatic study related to global warming. There are also studies of the winter conditions in coastal wetlands, off-road vehicle use and moisture regime in organic soils.

Studies are continuing on soil erosion along embankments, revegetation of trails, and the cold tolerance of plants in seasonal frost and permafrost regions.

Other CRREL News

The maturing of CRREL's staff has been recently marked by the retirement of three of its most prominent frozen ground researchers; Fred Crory, Frank Sayles and Thad Johnson. Crory is well known for his work with pile foundations in permafrost and Sayles for his studies of creep in frozen soils. Johnson was very active in pavements research. Crory and Sayles will continue to be associated with CRREL. CRREL is well aware that their expertise in the traditional permafrost foundation areas needs to be carried on by younger staff members and that new specialists need to be recruited to fill their vacancies. To foster communication, peer review and cross-fertilisation in frozen ground research, two new groups have been formed; the Pavements Research Group and the Geotechnical Engineering Group. Outside interest in these activities is welcome. Contact Steve Ketcham on Pavements Group and Ed Chamberlain on Geotechnical Group.

ASCE/TCCRE News

The Technical Council for Cold Regions Engineering (TCCRE) of the American Society of Civil Engineers (ASCE) was organised in 1977 and has grown rapidly in the past decade. Comprised of an executive committee and seven administrative and technical committees, it is listed as a special interest area by over 4,000 ASCE members. The Council sponsors International Cold Regions Specialty Conferences at 2 to 3 year intervals, being careful to avoid holding such a conference in the same year as the International Permafrost Conference. The next (6th) Cold Regions Specialty Conference will be held in Lebanon, New Hampshire, on February 26-28, 1991. TCCRE committees also produce monographs of cold regions engineering practice. These have received much favorable comment from practitioners. The Council further produces a quarterly journal of peer reviewed papers, entitled the ASCE Journal of Cold Regions Engineering. Two ASCE Society awards receive primary nominations from the Council, namely, the Can-Am Amity Award and the Harold R Peyton Award. A best paper award is also given for the Journal of Cold Regions Engineering. TCCRE committee members give important service to the organizing and conduct of International Permafrost Conferences. Included are the peer review of papers in the civil engineering area, as well as the solicitation of paper contributions to these Conferences. TCCRE also pays a part of the US annual dues for the International Permafrost Association.

INTERNATIONAL PERMAFROST ASSOCIATION CONSTITUTION AND BYLAWS

(Adopted 5 August 1987)

Preamble and Definitions

During the Fourth International Conference on Permafrost held in Fairbanks, Alaska, in July 1983, the International Permafrost Association (IPA) was founded. The founding countries were: Canada, The People's Republic of China, U.S.A., and U.S.S.R. The founding of the IPA and the election of its officers was announced at the closing Plenary session, a set of principles was distributed to the delegates, and other countries with an interest in permafrost were invited to become members of the IPA.

The organizations referred to in the Constitution and Bylaws are defined as follows:

(a) *Council* is the governing body of the Association.

(b) *Adhering National Body* is a representative organization or committee designated to represent in the Council of the Association the interests in permafrost of scientists and engineers of a country.

Constitution

1. *Objective*

The objective of the International Permafrost Association (hereafter called the Association) is:

To foster the dissemination of knowledge concerning permafrost and promote cooperation among persons and national or international organizations engaged in scientific investigations or engineering work on permafrost.

2. *Activities*

The Association will accomplish this objective by:

- (i) holding an International Conference on Permafrost approximately every five years
- (ii) holding Council meetings at the time of International Conference and, if required, at suitable times and locations between conferences
- (iii) cooperating with other national and international organizations whose aims are complementary to those of the Association
- (iv) exchanging information through its Adhering National Bodies
- (v) promoting cooperative activity and the development of knowledge concerning permafrost.

3. *Membership*

Membership in the Association is through Adhering National Bodies. There shall be only one Adhering National Body per country. National organizations wishing to join the Association must submit to the Secretary-General documentation showing the existence of a bona fide Adhering National Body, its mailing address and names of its officers. Membership in the Association must have the approval of two-thirds of the full Council. The Council has the right to terminate the membership of any Adhering National Body by a two-thirds majority vote of the full Council.

In countries where no Adhering National Body exists, an individual may apply directly to the Association to take part in Association activities.

4. *Adhering National Bodies*

An Adhering National Body is free to establish its articles of association and its organization in accordance with its requirements.

An Adhering National Body shall at all times keep the Secretary-General informed about its address, the names of its officers and of its representatives to Council.

5. *Officers of the Association (Executive Committee)*

The Officers of the International Permafrost Association are:

- (i) The President
- (ii) Two Vice-Presidents
- (iii) The Secretary-General

Either the President or one of the Vice-Presidents must be from the country hosting the next International Permafrost Conference.

The President and Vice-Presidents shall be nominated in accordance with the rules stated in the Bylaws and shall be elected by the Council. The President and Vice-Presidents shall be from different countries.

The officers of the Association shall serve from the end of one International Conference on Permafrost to the end of the next Conference. The President and Vice-Presidents shall not serve more than one term in the same office. The term of the Secretary-General may be renewed.

The President shall represent the Association and shall perform the duties pertaining to that office, as well as those entrusted to him by the Constitution and Bylaws or by the Council. The President shall be responsible, in collaboration with the Secretary-General, for the conduct of the affairs of the Association.

In the event of the resignation or death of the President, one of the Vice-Presidents will assume the office for the unexpired term of office.

In the event of the resignation or death of one of the Vice-Presidents, or if one of the Vice-Presidents assumes the office of President, the Council will appoint a successor from among its members who will complete the term of office. The choice of the President will be made by the remaining members of the Executive Committee.

The Secretary-General shall be appointed by the Council and shall not represent an adhering body on the Council.

6. *Council*

The Council shall consist of the officers and two representatives from each Adhering National Body.

Each Adhering National Body in good standing shall have a vote. If no official representative is able to attend a meeting of Council, his or her vote may be cast by an authorized deputy appointed by his or her Adhering National Body.

The Council shall be presided over by the President of the Association or, in case of his or her incapacity or inability to attend, by one of the Vice-Presidents. In the event of an equal decision of votes, the President or acting President shall cast the deciding vote.

The Council shall meet in ordinary session at the call of the President normally every five years during an International Conference on Permafrost. The Council may meet in extraordinary sessions at the call of the President or at the request of a majority of the Adhering National Bodies. The Council may make decisions by written communication on questions put to it through the Secretary-General with the approval of the President.

The Council may set up, by a simple majority vote, standing and ad hoc committees and working parties with whatever powers and terms of reference it may decide.

The Council shall determine, with the advice of the Secretary-General, the annual subscription fee to the Association. The Council shall approve the budget and authorize disbursement of funds.

7. *International Conference on Permafrost*

An International Conference on Permafrost shall be held approximately every fifth year in a country to be decided upon by the Council. The organization and financing arrangements of an International Conference are the responsibility of the Adhering National Body of the host country. The Adhering National Body shall follow the principles, rules and procedures for the Conference set out in the Bylaws and any additional procedures approved by the Council.

8. *Entry into Force of Constitution and Bylaws*

This Constitution and Bylaws shall come into force at the close of the session at which they receive the approval of at least two-thirds of the full Council.

9. *Amendments to Constitution and Bylaws*

Amendments to the Constitution and Bylaws must be proposed by an Adhering National Body. Such amendments shall be submitted in writing to the Secretary-General early enough to have the proposal submitted to all Adhering National Bodies at least six months prior to the Council meeting at which the amendment is to be placed on the agenda.

Adoption of an amendment will require an affirmative vote of at least two-thirds of the full Council.

Amendments to the Bylaws shall follow the same procedure except that a simple majority in favor of the amendments is required instead of two-thirds, as above.

10. *Non Profit Organization*

The International Permafrost Association shall be carried on without purpose of gain for its member countries and any profits or other accretions to the International Permafrost Association shall be used in promoting the objectives of the Association.

Bylaws

1. *Council*

- (i) A quorum for a Council meeting shall be a simple majority of the Adhering National Bodies, except if changes in the Constitution are to be made or a vote is to be held on the acceptance of an application for membership. In these cases, a quorum shall be two-thirds of the full Council.
- (ii) Any Adhering National Body that will not be present for a vote requiring a two-thirds majority may submit its views and vote in advance by mail. In this case that Adhering National Body will be regarded as being present for the purposes of the quorum for the vote.
- (iii) Voting shall in general be by a show of hands except for the election of the President, the place for the next International Conference on Permafrost or Council meeting, or for other matters specified at the time by the Chairman.
- (iv) Resolutions shall be made by a simple majority of those voting, except for resolutions altering the Constitution or on the acceptance of new Adhering National Bodies, for which the assent of two-thirds of the Council is required.
- (v) Adhering National Bodies wishing to have items placed on the agenda should submit them not less than six months before a Council meeting. Three months before the meeting the Secretary-General will send the complete Agenda to each Adhering National Body. The Agenda for the ordinary meeting of Council shall generally include the following items:
 - (a) Minutes of the previous meeting: matters arising
 - (b) Acceptance of new Adhering National Bodies
 - (c) Business raised by President
 - (d) Business raised by Adhering National Bodies

- (e) Business from other sources
- (f) Financial statement for preceding period and draft budget for ensuing period
- (g) International Conference
- (h) Election of President
- (i) Election of Vice-Presidents
- (j) Appointment of Secretary-General
- (k) Review of activities and reports of committees
- (l) Items submitted after preparation of agenda, subject to agreement of Chairman
- (m) Any other business

2. *Nomination of Officers*

The Executive Committee shall appoint a nominating committee of three people from Council two years before a conference. The nominating committee shall submit the name of one individual for President and two for Vice-Presidents to the Secretary-General one year before the conference. The nominating committee shall ensure that the nominees are willing to serve if elected. The Secretary-General, upon receipt of the report of the nominating committee, shall so inform the Adhering National Bodies. Additional nominations may be made by Adhering National Bodies prior to the meeting of Council.

3. *Secretary-General*

The Secretary-General shall be responsible, under the general direction of the President, for the conduct of all correspondence and current business of the Association, for the preparation and distribution of the Agenda of the Council meetings and for the preparation and maintenance of minutes.

The Secretary-General shall send to each Adhering National Body an annual account of the dues owing, and shall ensure that all contributions and dues paid to the Association are placed in a separate account and that a record is kept. The Secretary-General is responsible for keeping the accounts of the Association, for the preparation of the annual budget of receipts and expenditures, for payments on behalf of the Association up to the limit of the approved budget, and shall acknowledge all monies received. The Secretary-General shall prepare a summary of the accounts for each meeting of the Council and shall give any explanation required of expenses incurred.

4. *Conferences*

- (i) Invitations to act as host for an International Conference on Permafrost and the accompanying Council meeting shall be considered at the meeting of the Council at the time of the preceding International Conference.

The inviting country must provide assurance that no individual will be denied attendance on grounds of nationality, race, creed or political views. If an invitation is received from more than one Adhering National Body the final selection shall be made by secret ballot.

Arrangements for the International Conference on Permafrost shall be the responsibility of the Organizing Committee of the host country, in consultation with the Executive Committee.

- (ii) Adhering National Bodies or their affiliates are encouraged to organize technical meetings and conferences. These may be designated as co-sponsored by the International Permafrost Association if approved by the Council.

For further information contact:

The Secretary General.

Other US News

Members of the US Committee for the International Permafrost Association have been appointed by the US National Academy of Sciences. Dr C W Lovell, Professor of Civil Engineering, Purdue University is the new chairman. "Bill" served as Vice-Chair, USC/IPA for the past five years. Additional members of the USC/IPA are Dr Ed Link, Director, CRREL; George Gryc, U S Geological Survey; Bernard Hallett, University of Washington; Priscilla Grew, Director, Minnesota Geological Survey; and Rupert Tart, Golder & Associates. Jerry Brown, Past Chair, USC/IPA has volunteered to continue preparing the US news report, in addition to his responsibilities as Chair, IPA Editorial Committee.

US Geological Survey scientists K A Kvenvolden and T S Collett continue to investigate the methane composition of permafrost with recent sampling around Fairbanks. They also visited with Soviet colleagues in Leningrad and Moscow at VNII Okeangeologia, VINIGNI, and the Shirshov Institute of Oceanology. In a recent paper Kvenholden estimated the rate of methane release from gas hydrates to be 2-3 megatons of methane carbon per year. Collett et. al. have recently published "Map showing the depth to the base of the deepest ice-bearing permafrost as determined from well logs, North Slope, Alaska". 1:1,000,000 Map

OM-222, 1989.

C I Ping, University of Alaska and J P Moore, Soil Conservation Service, are investigating the properties of permafrost soils in Alaska wetlands. They are studying soil thaw and the reappearance of permafrost following vegetation succession after recurring wild-fires in Subarctic Alaska. Problems of soil and wetland classifications are also under investigations.

Craig Gerlach is the new director of the Alaska Quaternary Centre, University of Alaska-Fairbanks. He replaces David Hopkins who is now "Director Emeritus" at the QRC and who was also a member of the USC/IPA for the past five years. The QRC and staff are involved in many permafrost and periglacial activities as well as teaching a number of Quaternary courses. Hopkins, Dale Guthrie and Andrei Sher (Visiting Professor, USSR Academy of Sciences, Moscow), will teach a course during Spring 1991 on Paleoecology of Beringia.

The Binghamton Periglacial Symposium is planned for Buffalo, New York, 21-22 September 1991. For further information contact: Athol Abrahams, Department of Geography, State University of New York, 415 Fronczak Hall, Amherst, NY 14260 (Phone 716-636-2722).

MISCELLANEOUS

International Arctic Science Committee

The Founding Articles for the International Arctic Science Committee, IASC, were signed on 28 August, 1990, in Resolute Bay, Canada, by representatives of national scientific organizations in the eight Arctic countries. National scientific organizations in other countries are also welcome to join provided they are "engaged in significant arctic research".

IASC is a non-governmental scientific organization established to encourage and facilitate international consultation and cooperation for scientific research concerned with the Arctic. It endeavours to cover all subjects and fields of science for the advancement of

world science and for the benefit of the Arctic regions. IASC will take into account programmes and activities on Arctic research advanced by other scientific organizations and will cooperate with them whenever appropriate.

IASC is composed of:

- The Council
- The Regional Board
- Working Groups
- The Arctic Science Conference
- Secretariat

Although IASC will not be fully operative until the Council members are nominated, the representatives at the Founding Meeting made a series of recommendations:

- the nomination process for Council members should be terminated by November 15 and a first meeting of the Council to be held in Oslo, Norway, in January 1991;
- rules and procedures were worked out in Resolute including further details on application procedure and qualifications of new participants. These rules would have to be adopted by the first Council Meeting;
- the Secretariat will be located in Oslo, Norway, and Odd Rogne, Director of the Norwegian Polar Research Institute, shall serve as Interim Secretary until a formal Secretariat is established;
- some initial cooperative fields were identified and a coordinator or initiator was asked to take initial actions. Subject areas were:

- Global Change in Arctic Regions
- International aspects of the social and human sciences in Arctic regions
- Compilation of an inventory of major arctic scientific activities of international interest
- Preparation of an issue paper and comparability and compatibility of data in key areas of the Arctic.

In addition to science representatives of the Arctic countries, science representatives from France, Germany, Japan, Poland and United Kingdom were invited as observers to the formal Founding Meeting and were asked to participate fully in the science discussion meeting. It was generally agreed that IASC should start an action programme that will show scientific results in the short term.

A complete report from the meeting will be available at the end of the year.

Summary prepared by Odd Rogne, NPI.

IPCC—THE PERMAFROST IMPLICATIONS

Such is the pace of scientific change, that the deliberations of the Intergovernmental Panel on Climatic Change (IPCC) during mid-1990 have already been widely disseminated and discussed. The reports concerned were historic in scale and significance, and in part deal closely with the permafrost world. The core volume has been published as *Climatic Change: The IPCC Scientific Assessment* by Cambridge University Press, edited by J.T. Houghton, G.J. Jenkins and J.J. Ephraums. A 26-page *Policymakers' Summary of the Report of Working Group I to the Intergovernmental Panel on Climatic Change* has been published for WMO and UNEP by the Meteorological Office, UK.

Of more direct concern to the permafrost community will be *Potential impacts of climate change: Report from Working Group II to IPCC* compiled and edited by C. Griffiths, G.W. Sheldon and W.J. McG. Tegart. Chapter 7 covers *Seasonal snow cover, ice and permafrost*, a study co-chaired by R.B. Street (Canada) and P.I. Melnikov (USSR). It should be remembered that the purpose of the IPCC volumes is to provide guidance to policymakers, not to advance the research

horizons. As a consequence, much of their content is the background against which proposed changes can be understood. Particularly vulnerable would be the many thousands of square kilometres of permafrost within 1°–2°C of melting point, and it is widely predicted that areas of permafrost currently less than 25 m thick would be completely lost over a period of 100–200 years. Thus a 1°C global warming would probably induce a northward shift of the boundary of the climatic zone supporting permafrost by around 200–300 km, while a 2°C warming would induce a 700 km northward shift in this climatic boundary. Of course, the response of the permafrost itself would be neither rapid nor simple. A first order effect would be deepening of the active layer, leading to widespread slope failure and accelerated erosion. Ecologically, the deeper active layer would permit long-term encroachment by deep-rooting species, but in the short term a reduction in number of species could be triggered, especially where water-table fall induced by lowering of the permafrost surface created drought. Second order effects are much more complex. The precipitation changes to be expected are much less clear even than

the current somewhat unstable temperature predictions, and the results of precipitation change are likely to be regionally or locally specific. The suggestion that a 50% reduction in the rates of permafrost decay predicted on the basis of temperature alone would result may be speculative. Furthermore, all of the above-mentioned changes relate exclusively to climatic impacts. If changes in the buffering action of the surface layer (snow, vegetation, organics and mineral soil) are incorporated, the changes likely to occur lie beyond the current level of forecasting ability. Taken overall, the evidence seems to point to maximum soil thermal change in the northern continental regions rather than the maritime fringes.

What is clear, is that change seems inevitable even where the precise nature of that change cannot be predicted. Permafrost degradation will challenge northern communities with the need for a substantial increase in maintenance requirements for facilities with permafrost foundations. Remedial works and retrofitting of supplementary structures will be required. Structures on thaw-sensitive materials could face serious settlement problems. In addition to maintenance costs, climatic change will add substantially to the budget required for monitoring if significant failures are to be avoided. This requirement will apply to dams as well as buildings, transport or utility lines. Having been engineered for frozen ground conditions, permafrost mines could suffer problems of instability or

water incursion—though the timescale may be too long to pose a serious threat within the economic life of any one mine. More difficult to predict and manage are possible changes in the stability or behaviour of waste materials from mine tailings to leachates. Changed disposal regulations will probably be needed, and there may be a need for retrospective clearing of toxic materials already dumped.

The report concludes that long-term permafrost temperature transects of deep (100–2000 m) boreholes are required to provide information on regional variations in permafrost response to a warming climate. Methane monitoring is also important, as is monitoring of permafrost structures and waste materials. A key requirement is seen to be international agreement on mapping criteria and definitions for permafrost survey—a requirement foreseen by the IPA permafrost mapping project described in the report from the IPA Editorial Committee in this edition of *Frozen Ground*. Not surprisingly, the IPCC Working Group also recommends increased dynamic modelling of permafrost processes, wherever possible in the context of international studies. In engineering terms, there will be a need for new techniques of permafrost design, particularly for retrofitting.

Working Group II report is scheduled to be published by the Australian Government in January 1991.

Summary prepared by Mike Clark

International Geological Correlation Program Project No. 297 “*Geocryology in the Americas*”

The International Geological Correlation Programme Project No. 297 meeting on the Geocryology of the Americas held its meeting on the Geocryology of Southern Africa, September 5-17, 1990, at Rhodes University, Grahamstown, and Natal University, Pietermaritzburg, South Africa. Field work took place over nine days in the Drakensberg region.

Nineteen geocryologically oriented scientists participated representing seven countries: Arturo E Corte (Argentina project leader); J P Lautridou (France); Lothar Schrott (Germany); Helio Rybicta (Poland); Michael Clark (USA); Nikolai Romanovskij (USSR).

The Organising Committee was Colin A Lewis (Chairman), Rhodes University; H Beckedahl (University of Transkei); J Boelhouwers (University of

Western Cape); Kevin Hall (University of Natal); P Hanvey (University of Witwatersrand); and M Marker (University of Port Hare). Also included were the following participants from South Africa: Mr E Dollar; Professor John R Grindley; Mr Colin D Hobson; Ms Merle Howarde-Browne; Dr Janette A Lindesay; Professor Rodney R Maud and Mr Wilson J Rooy.

Papers were presented during four days. A field guide to the geocryogenic features in the Drakensberg region with 87 pages, 38 figures, geologic maps and cross sections prepared by Patricia M Hanvey, was the basis for the field discussions. During the field trip each profile was carefully studied, analysed and discussed; accordingly alternative views on origin were presented. It was agreed that there is present geocryogenic action in Southern Africa. Also there is evidence

of activity during the Quaternary. However, the type and intensity of each of the geocryogenic processes operating during the Quaternary needs further analysis.

During the field trip it became evident that Project 297 will be strengthened by increasing the knowledge of zonation in different geocryogenic regions. For example we need to know the essential marks of the subtropical and tropical mountain geocryogenic facies as compared to the polar facies. A small group of experts should work on a basic questionnaire to be distributed.

The International Permafrost Association and the International Geographical Union the Commission on Frost Action Environment were represented at this

meeting through the participations of different members of the IPA's working groups: on Mountain Permafrost; on Terminology and on Global Changes and Permafrost.

The success of this meeting was the result of well organised paper presentation, field trips and an overall well planned event which needs to be sincerely appreciated and thanks extended to the Organising Committee.

The next meeting of Project 297 is 26-31 July, 1992, Rocky Mountains, Alberta, Canada, organised by Stuart Harris, University of Calgary. And/or 1-7 August, 1992, Indian Peaks, Colorado, organised by William Wayne, University of Nebraska, Lincoln, Nebraska, USA.

Canadian Workshop on Permafrost and Climate Change

A Symposium on the Arctic and Global Change was held in Ottawa on 25-27 October 1989. The purpose of this half-day workshop was to make business and government leaders aware of the significance of permafrost for Northern Canada, the special properties of permafrost terrain and of its particular sensitivity to climate change. The presentations emphasised the implications of climate change for permafrost conditions in Canada, and for northern environments and development. The workshop was convened by J. A. Heginbottom, A.S. Judge and D.G. Harry, and chaired by Dr. D.A. St-Onge, Director, all of the Terrain Science Division of the Geological Survey of Canada (GSC).

The Presentations

In their introductions, St-Onge and Heginbottom emphasised that the presentations would focus on areas of active research, with the speakers presenting their own research subjects, and that not all aspects of permafrost and global change related research at GSC would be covered. Research on the relationships between climate change and permafrost is being undertaken because we do not know the real impacts of climate change. At present the problem is too complex, with many poorly understood factors and forces, and with complex feedback loops. Nevertheless, the

effects, as now anticipated are potentially sufficiently serious that research is essential for the future well-being of society and the economy of the north, and of Canada as a whole.

The presentations all assumed a common scenario of climate warming of about 2°C over the next 50+ years, and a sea level rise of 30 to 50 cm. This will not necessarily be valid everywhere; some areas will get cooler, and there will be significant local variability at all scales, both spatially and temporarily. Most examples used in the presentation were from the western arctic, particularly the Mackenzie-Beaufort Region. This is the best known area of Canada, with regard to permafrost conditions, with research by the Geological Survey and others carried out in this region for over 20 years. Some of the presentations were rather speculative; an attempt was made to identify the assumptions which were made. Some of what was said was also scientifically rather controversial. The objective, however, was to indicate the range of possible effects. As research continues, the speculations will change and, one hopes, the uncertainties will be reduced.

Discussion

The discussion focused on three main issues:

- (i) communication of critical concepts and information to decision makers, including political, industrial and commercial leaders, and to the public at large;
- (ii) the costs involved and which segments of society would pay them;
- (iii) the adequacy of presently available climatic models as the basis for decision making.

Communication

The workshop presentations were seen as too scientific for direct presentation to the policy level and the general public. A more appropriate approach would be the production of bold, simple maps showing vulnerable areas of Canada, eg: ice-rich sediments in urban areas, or areas of erosion-susceptible coastline. Maps of this sort should be available soon at a regional scale for the purpose of planning new developments and could also be produced at a large, detailed scale for northern town sites to assist the town engineers in planning responses to climate warming with regard to existing buildings and the infra-structure of roads, water supply, waste disposal, etc.

Costs

The cost implications of coping with the effects of climate warming on existing buildings and infrastructure elements is likely to be significant. With regard to existing structures, the cost of modifications or reconstruction would fall, directly or indirectly, on the public at large, as there is no other source available. In the case of commercial structures, and utilities such as stores or pipelines, the cost will be passed on to the consumer at higher prices. For public institutions, such as power companies or school boards, the costs will go into the rate-base or the tax base, and thus also onto the consumer.

In the case of new construction, some of the long term costs can be mitigated by designing and building in some level of adaptability or flexibility, including the ability to retrofit existing structures. Clearly, any level of built-in adaptability will increase the initial cost, but the future savings may well justify this. The application of some form of risk analysis techniques, such as are used in setting design levels for earthquake resistant structures, should give useful guidance here. Inaction itself will also have a cost, and should be fully considered, along with the costs of the active options.

Climate Models

The approach to increased atmosphere CO₂ used by

most climatic modelling programs presently in use is to develop a steady state climate with a "normal" level of CO₂, then double the CO₂ content of the atmosphere and run the model until a new steady rate is achieved. From this, predictions of new climate patterns are drawn. The philosophy of this approach was called into question, as the instantaneous doubling of CO₂ is quite unrealistic. Climatic change is a relatively slow, though continuous process, with CO₂ doubling expected to take 50 to 100 years to be achieved. Thus, meaningful answers are neither needed nor possible right now.

In countering this view, two points were offered. First, there is now a public perception that CO₂ induced climatic warming is a serious concern. As such, therefore, it merits the best available scientific commentary. If earth scientists do not respond, or respond by refusing to give answers, they will be exposed to considerable criticism as to the value of their work over the last several decades, and the general level of cynicism within government, regarding earth science work as a whole, will increase. The second comment reiterated the need to build adaptability or flexibility into new structures and new endeavours, such that changing predictions of future conditions can be accommodated.

Conclusions In concluding the discussion, Dr. St-Onge noted that it is important for earth scientists to provide the best possible answers at any given time. This is a fundamental responsibility. In discharging this, we must transmit what we know in better, clearer and simpler ways to the general public; we have to communicate better, and to be responsive to the needs of society. Recently we have focused the accumulated knowledge of several decades of earth science on a new issue—global change, or rapid evolution of the environment. The results of this refocussing must be presented, in a non-technical way, to as wide an audience as possible.

J.A. Heginbottom
Rapporteur

The proceedings of the Symposium on the Arctic and Global Change are now available for \$75 (US) plus \$2 for postage. Mailing from Climate Institute, Suite 402, Pennsylvania Avenue SE, Washington DC, 20003, USA.

FIRST ANNOUNCEMENT
Sustainable Development in Circumpolar Regions
1–8 June 1991, Surgut, Siberia

The Conference will be organised by the Institute of Northern Development, Siberian Branch, USSR Academy of Sciences and Centre for Northern Studies and Research, McGill University. It will take place in the Soviet Union, 1–8 June, 1991 in Surgut, located at 61°14'N/73°20'E, and situated near Samotler, the largest oil field in the USSR. Surgut plays the role of the main housing, industrial and supply centre of the Middle Ob' oil region. Its population is about 200,000. The Conference program will include a tour of oil and gas production sites.

The increasing global environment problems make it essential to focus on development within a sustainable perspective. The Conference will include sessions with presentations of papers, workshops and field tours.

The aims of the Conference are:

1. To establish communication among persons with special interests and knowledge about contemporary production and science related to circumpolar regions.
2. To spread knowledge about circumpolar regional development.
3. To analyse sustainable regional circumpolar development in models and cross-regional studies.

4. To analyse subjects of special interest for sustainable development in circumpolar regions.

5. To formulate strategies for activities in circumpolar development, including researches in the cryosphere.

Sessions will be held on:

1. Management of sustainable development.
2. Ethics of northern development.
3. Economics of sustainable development.
4. Man's health in the north.
5. Oil and gas production in the Arctic cryosphere.
6. Circumpolar environmental, technology and economics.

The presentation of papers will take place during the first three days. Each day there will be a plenary session with a keynote speaker. There will be a Soviet and Western chairperson and discussants for each session.

To participate in the Conference please contact:
(1) Centre for Northern Studies and Research, McGill University, Burnside Hall, 805 Sherbrooke St West, Montreal, Canada, H3A 2K6. Tel: (514) 398-6052; Fax: (514) 398-8364; (2) Organising Committee, Institute of Northern Development, Siberian Branch, Academy of Sciences, USSR, 625003, Tyumen, P.O.B. 2774, USSR.

IGCP 253: Termination of the Pleistocene

The aim of this project is to study relationships and interactions between climate and the global hydrologic cycle during the last glacial-interglacial transition by means of geological records. The period 18,000 to 8,000 B.P. encompasses environmental changes that were profound in nearly all regions of the world. In both the high and low latitudes alterations of circulation patterns and pressure gradients accompanied shifts in ocean current and sea-surface temperatures. The geological records of these changes are found in the

marine, lacustrine and terrestrial sequences, fluctuations of the margins of ice sheets and local glaciers, shorelines etc. The changes led to profound changes in the distribution of biota on the face of the planet. Great activity is already in progress as far as the oceans are concerned. Their data indicate the presence of ice sheets, but it is our aim to describe the detailed distribution of ice during the period under consideration. This work must be coordinated on the continents in the same way as is already done in the oceans.

The time period targeted for study encompasses not only the last deglaciation, but also the last period of peak seasonal solar radiation in the northern hemisphere. At ca. 10,000 yr B.P. summer insolation was at a maximum there, while it reached a corresponding minimum in the southern hemisphere. Astronomic factors, which can be summarised as Milankovitch forcing, affected pluvial climatic conditions in desert regions, and episodes of aridity in other deserts. These are critical aspects of the global hydrologic budget that can be explained in the context of (1) the impact of the disappearance of the continental ice sheets and (2) the effect of Milankovitch forcing on monsoonal circulations. Studies of the geological record in different parts of the globe will help us to interpret these relationships.

The research proposed here involves the study of a finite set of geologic, paleoclimatic and paleohydrologic parameters that can be, or have been, well-dated. While this will involve the assessment of paleoclimatic phenomena that will already be partially understood, the global focus of the project, and emphasis on the specific problem of regional water budgets, will provide new insight on large-scale causes and effects. New research will cover areas of critical information need.

The programme is divided into a series of thematic subprojects one of which is connected with permafrost: "Changes in permafrost conditions". A work group has been formed for every subproject, the primary aim of which is the compilation of our present knowledge within the field of work group. Where knowledge is incomplete, research should be initiated.

The work of the subproject "Changes in permafrost conditions" should evidently be started with compiling regional surveys on which data are presently available on the time interval covered by the project (18,000 to 8,000 B.P.), which changes in permafrost regions are most typical of the transition from Pleistocene to Holocene, and which methods might be used to obtain as detailed information as possible. A working meeting of the project has been planned during the XIII INQUA Congress in 1991 in China. In connection with this I would also like to call together the working group of our subproject.

To start the work of our subproject more effectively, I would be grateful for advice and suggestions. I also expect definite proposals with a desire to participate in the work of our group. Further information can be obtained from: Dr. Rein Vaikmäe, Institute of Geology, Estonian Academy of Sciences, 7 Estonia Puiestee, 200 101, Tallinn, Estonia.

Permafrost and Periglacial Processes

The permafrost community will be very interested to learn of the progress of its own new journal from John Wiley. Many may have seen copies already but in case you have missed them, the following contents list may encourage you to seek further details.

Volume 1, Issue No. 1

Implications for Palaeoenvironmental Reconstruction of Recent Ice-Wedge Development at Mayo, Yukon Territory; C.R. Burn. *Some Observations on the Growth and Deformation of Epigenetic, Syngenetic and Anti-Syngenetic Ice Wedges*; J.R. Mackay. *Observations on Buried Glacier Ice and Massive Segregated Ice, Western Arctic Coast, Canada*; H.M. French and D.G. Harry. *Permafrost and Groundwater Conditions, Huola River Basin, Northeast China*; Baolai Wang. *Analysis of the Segmentation in the Profile of Alpine Talus Slopes*; B. Francou and C. Manté. *Mechanical Weathering Rates on Signy Is-*

land, Maritime Antarctic; K. Hall. *Apparent Hydraulic Conductivities Associated with Thawing, Frost-Susceptible Soils*; P.A. Egginton and L.D. Dyke.

Volume 1, Issue No. 2

Niveo-aeolian Sedimentation and Resulting Sedimentary Structures: Søndre Strømfjord Area, Western Greenland; J.W.A. Dijkmans. *Geomorphic Impact of Spring Avalanches in Northwest Spitsbergen (79°N)*; M.-F. André. *Alpine Debris Flows and Their Sedimentary Properties. A Case Study from the French Alps*; M.E. Nieuwenhuijzen and H. van Steijn. *Drainage Karstique en Milieu de Pergélisol: le Cas de L'île D'Akpatok, T.N.O. Canada*; B. Lauriol and J.T. Gray. *Periglacial Phenomena in New Zealand*; J.M. Soons and L.W. Price. *Development of Thermokarst Lakes During the Holocene at Sites Near Mayo, Yukon Territory*; C.R. Burn and M.W. Smith.

Volume 1, Issue 3-4

Late Pleistocene Ice-Wedge Casts and Sand Wedge Relics, Wyoming, U.S.A.; T.C. Nissen and B. Mears. *Relict Periglacial Features East of Waterton-Glacier Parks, Alberta and Montana*; E.T. Karlstrom. *Observations on Winter Aeolian Transport and Riveo-Aeolian Deposition, Crater Lake, Pangniting, N.W.T., Canada*; C. McKenna-Newman. *An Investigation into*

Mechanisms Producing Solifluction in Slope Deposits; B. Francou. *Apparent Thermal Diffusivity in a Refreezing Active Layer*; K.M. Hinkel, S.I. Outcalt, F.E. Nelson. *Un Pingo en Système Fermé dans des Dolomies Paleozoiques de l'Arctique Canadien*; D.A. St.-Onge and A. Pissart. *Cryogenic Physics-Chemical Precipitations: Iron, Silica, Calcium Carbonate*; T. Vogt.

The International Association of Geomorphologists

The first official issue of the newsletter of the International Association of Geomorphologists (I.A.G.) has been presented. This initial issue is numbered 7 in recognition of the six previous issues edited by Professor H.J. Walker from 1985 to 1989 that played an important role in the establishment of I.A.G. Newsletter. I.A.G. will be published twice a year, normally in May and November, and be distributed to all geomorphologists through a National Delegate or Corresponding

Member for each country. The I.A.G. includes a broad interest in glacial, proglacial and periglacial geomorphology. To ensure the success and usefulness of the Newsletter, geomorphologists are asked to submit thoughts as to what should be included in future issues. Please send your ideas as well as material to the Newsletter, at any time, to: T. Suzuki, Publications Officer, I.A.G., Institute of Geosciences, Chuo University, Kasuga, Bunkyo-ku, Tokyo 112, JAPAN.

Calendar of Recent and Forthcoming Meetings

1991

Sixth International Conference on Cold Regions: Cold Regions Engineering Technology for the 21st Century

26-28 February 1991

Contact: Devinder Sodhi, CRREL, 72 Lyme Road, Hanover, NH, 03755-1290, USA.

Phone: (603) 646-4100., Fax: (603) 646-4278.

Workshop on Cold Regions Mechanical Weathering

29 April—1 May 1991, Caen, France

Contact: J-P. Lautridou, Centre de Geomorphologie, CNRS, Rue de Tilleuls, Caen 14000, France.

Periglacial Environments in Relation to Climatic Evolution

3-6 May 1991, Amsterdam, The Netherlands

Contact: Prof. J. Vandenberghe, Institute of Earth Sciences, Free University, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands.

International Arctic Technology Conference

29-31 May 1991, Anchorage, Alaska

Contact: Society of Petroleum Engineers, PO Box 833836, Richardson, TX 75083-3836, USA.

Telex: 730989 Spedal., Fax: (214) 669-0135.

Sustainable Development in Circumpolar Regions Conference

1-8 June 1991, Surgut, USSR

Contact: Organising Committee, 625003, Tyumen: Box 2774, Surgut, Siberia, USSR

Third International Symposium on Cold Regions Heat Transfer

12-14 June 1991, Fairbanks, Alaska, USA
Contact: Stephanie Faussett, Institute of Northern Engineering, University of Alaska, Fairbanks, Alaska 99775-0660, USA.
Phone: (907) 474-6113. Fax: (907) 474-6087.

ISCORD 91, International Symposium on Cold Region Development

16-21 June 1991, Edmonton, Alberta, Canada
Contact: ISCORD 91, PO Box 8330, Postal Station 'F', Edmonton, Alberta, Canada T6H 5X2.
Phone: (403) 450-5218. Fax: (403) 450-5198. Telex: 0372147.

Tenth International Conference on Offshore Mechanics and Arctic Engineering

23-28 June 1991, Stavanger, Norway
Contact: Nirmalk Sinha, OMAE/ASME National Research Council of Canada, Ottawa, Ontario, Canada K1A 0R6.

XIII INQUA Congress—Man and Global Change during the Quaternary

2-9 August 1991, Beijing, China
Contact: Secretariat, XIII INQUA Congress, Chinese Academy of Sciences, 52 Sanlike, Beijing, 100864, China.
Phone: (86) 3062, (86) 8361.
Cable: BEIJING SISICADEMY, Telex: 22474 ASCHOCH, Fax: 8011095.

International Offshore and Polar Engineering Conference

11-15 August, 1991, Edinburgh, United Kingdom
Contact: ISOPE-91, 4 Frederick Sanger Road, Surrey Research Park, Guildford, Surrey, GU2 5YJ, United Kingdom.
Phone: 44-483-301219, Fax: 44-483-302184.

XX General Assembly IUGG

11-24 August 1991, Vienna, Austria
Contact: F. Nobilis, Hydrographisches Zentralburo, Marxergasse 2, A-1030 Vienna, Austria.
Phone: +43 222 71100 Ext. 6944. Fax: +43 222 7139311.

Symposium on Water and Ice as Geophysical Agent

Contact: J. Klinger, University of Grenoble, CNRS, BP 96, 38402 St. Martin d'Hères, Cedex, France.

Mountain Glaciology—Relation to Human Activities

26-30 August 1991, Lanzhou, China
Contact: Secretary-General, International Glaciology Society, Lensfield Road, Cambridge, CB2 1ER, UK.
Phone: 233-355974, Fax: 233-336543.

Symposium on the Physics and Chemistry of Ice 1-6 September 1991, Sapporo, Japan

Contact: Norikazu Maeno, Institute of Low Temperature Science, Hokkaido University, Sapporo 060, Japan.

International Permafrost Association: Permafrost and Periglacial Environments in Mountain Areas 16-20 September 1991, Interlaken, Switzerland

Contact: Laboratory of Hydraulics, Hydrology and Glaciology, Federal Technical Institute, Zurich, Switzerland.

Periglacial Geomorphology Symposium

21-22 September 1991, Buffalo, New York, USA
Contact: Athol Abrahams, Department of Geology, SUNY, Buffalo, New York 14260, USA.
Phone: (716) 636-2722

6th International Symposium on Ground Freezing September 1991, Beijing, China

Contact: ISGF 91, Central Coal Mining Research Institute, Hepingli, Beijing 100013, Peoples Republic of China.
Phone: 421 4931. Fax: 421 9234. Telex: 22504 CCM-RI CN.

1992

Polartech '92: International Conference on Development and Commercial Utilisation of Polar Technologies in Polar Regions

22-25 January 1992, Montreal, Canada
Contact: Dr. Marianne Stenbaek, Centre for Northern Studies and Research, McGill University, Burnside Hall 720, 805 Sherbrooke St West, Montreal, Canada.
Phone: (514)398-6052, Fax: (514)398-8364, Telex: 05-268510.

**Symposium on Remote Sensing of Snow and Ice
17-22 May 1992, Boulder, Colorado, USA**

Contact: Secretary-General, International Glaciological Society, Lensfield Road, Cambridge, CB2 1ER, UK.

Phone: 233-355974, Fax: 233-336543.

**International Geological Correlation Programme
Project No 297 "Geology of the Americas"**

26-31 July 1992, Alberta, Canada

Contact: Arturo E Corte, Chairman, C.C. 330-5500 Mendoza, Republica Argentina.

IGU Pre-conference field trip

1-7 August 1992, Indian Peaks, Colorado, USA

Contact: Colin Thorn, Dept. of Geography, University of Illinois, 607 South Mathews 220, Urbana, IL 61808, USA.

27th Congress of the International Geographical Union, Washington DC, USA

9-19 August 1992, Washington DC, USA

Contact: Anthony R. de Sousa, Secretary-General, 27th International Geographical Congress, 1145 17th Street NW, Washington DC 20036, USA.

29th International Geological Congress

24 August-3 September 1992

Contact: Secretary General, ICG-92, PO Box 65, Tsukuba, Ibaraki, 305, Japan.

Phone: 81-298-54-3627, Fax: 81-298-54-3629.

**Symposium on Snow and Snow-Related Problems
(part of an International Forum on Snow Areas)**

14-18 September 1992, Nagnoka, Japan.

Contact: Secretary General, International Glaciological Society, Lensfield Road, Cambridge, CB2 1ER, United Kingdom.

Phone: +223 355974, Fax: +223 336543.

1993

Third International Conference on Geomorphology

23-29 August 1993, Hamilton, Canada

Contact: McMaster University, Hamilton, Ontario, Canada, L8S 4K1.

Phone: (416) 52 9140 X 4535, Telex: 061-8347, Fax: (416) 546 0463.

**6th International Conference on Permafrost
5-9 July 1993, Beijing, China**

Contact: Cheng Guodong, Lanzhou
Institute of Glaciology and Geocryology,
Academia Sinica, Lanzhou, 730 000, China
Telex: 72008 IGGAS CN

Important Dates

August 1, 1991—First Bulletin, call for papers

December 1, 1991—Abstract deadline

February 1, 1992—Notification to authors

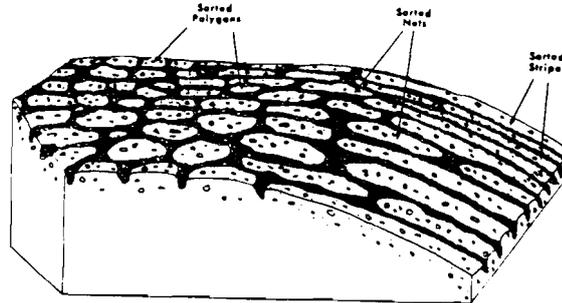
June 1, 1992—Deadline for paper submission

December 1, 1992—Second Bulletin

April 1, 1993—Pre-registration deadline

Periglacial Geomorphology
Twenty-second Annual Binghamton
Geomorphology Symposium

September 21 and 22, 1991
State University of New York at Buffalo
Buffalo New York



The symposium will focus on recent advances in periglacial geomorphic research with particular emphasis on research in North America. Papers will focus on geomorphic processes in both arctic and alpine periglacial environments. Future directions of periglacial geomorphic research in North America will be identified.

Topics and Speakers

- | | |
|--|---|
| *Periglacial Geomorphology:
What?, Where?, When?. Colin Thorn | *Active Layer Processes in Patterned
Ground Areas. Bernard Hallet |
| *Summit Elevation Landforms and
Landscapes in the Appalachians.
Michael Clark | *Active Layer Detachments in Arctic
Canada. Tony Lewkowicz |
| *Patterns of Geochemical Denudation
and Snow Distribution in an Alpine
Environment. Nel Caine | *Plugs and Associated Patterned
Ground on Cornwallis Island, Arctic
Canada. Lincoln Washburn |
| *Glacier Margin Weathering Processes.
James Gardner | *Nature and Origin of Ground Ice,
Western Arctic Canada. Hugh French |
| *Microstripe Generation and Soil
Characteristics in the Andes.
Francisco Perez | *Formation of Seasonal Ice Bodies
Robert Van Everdingen |
| *Hydrologic and Rheologic
Characteristics of Rock Glaciers.
Rick Giardino, Jack Vitek and Joseph
Demorett | *Mechanical Weathering Processes
in Antarctica. Kevin Hall |
| *Snow Avalanche Paths: Sites of
Periglacial Processes and Geomorphic
Hazards in Mountain Environments.
David Butler | *Dynamics of Growth and Decay
in Palsa-scale Frost Mounds.
Fritz Nelson, Ken Hinkel, Sam
Outcalt |
| | *Frost Action Forces. Michael
Smith |
| | *Periglacial Processes in Coastal
Dunes. Jane Law |

POSTERS dealing with periglacial geomorphic research in arctic and alpine environments are solicited. Abstracts for posters will be refereed for scientific content and appropriateness: accepted poster abstracts will be printed in the symposium program. Abstracts are due by August 1, 1991. Early notification of intent to contribute a poster is appreciated.

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Sixth International Conference on Permafrost

5-9 July 1993, Beijing, China

Announcement

It is a great pleasure to the Organizing Committee to announce the Sixth International Conference on Permafrost, which will take place in Beijing, China, from 5 to 9 July 1993. The organizers extend a cordial invitation to attend the Conference.

The Sixth International Conference on Permafrost will be held under the auspices of the International Permafrost Association (IPA), which was founded in 1983, and the Chinese Society of Glaciology and Geocryology (CSGG), which is the Adhering National Body of the International Permafrost Association (IPA), and will be organized by the Lanzhou Institute of Glaciology and Geocryology (LIGG), Chinese Academy of Sciences, with the collaboration of the National Frozen Soil Engineering Laboratory of LIGG.

Conference Themes

The Conference themes are permafrost science and permafrost engineering, including:

Permafrost Science

Climatic change and permafrost
Regional permafrost
Periglacial phenomena
Physics and chemistry of frozen ground
Heat transfer processes
Hydrology
Ecology
Prediction of natural hazards and environmental protection

Permafrost Engineering

Site investigations and terrain evaluation
Geophysical exploration
Remote sensing and mapping
Geotechnical problems
Petroleum engineering
Mining engineering
Municipal engineering
Road construction
Water conservation

Language

The official language of the Conference is English. No translation facilities will be provided.

Technical Excursions

A) Tour to Lhasa. Field trip starts from Lanzhou, crosses the Qinghai-Tibet Plateau, and ends in Lhasa. The duration of the excursion will be about 10 days and transport will be by coach.

B) Tour to the Tianshan Mountains. Field trip starts and ends in Ürümqi. The duration of the excursion will be about 7 days. Transport by train.

C) Tour to northeast China. Field trip starts and ends in Harbin. The duration of the excursion will be about 7 days. Transport by train.

Guidebooks will be provided for all excursions.

Programme for Accompanying Persons

Pre- and post-conference scenic tours to south and central China, and to east China, for those persons accompanying the conference participants are currently planned to offer them an opportunity to view and visit many places of interest. Details will be given in the First Bulletin.

Correspondence and Preliminary Questionnaire

All correspondence pertaining to the Conference should be addressed to:

Prof. Cheng Guodong
Lanzhou Institute of Glaciology
and Geocryology
Chinese Academy of Sciences
Lanzhou 730000, China
Telex: 72008 IGGAS CN

Please complete, copy and send to Prof. Cheng Guodong:

Name _____

Title _____

Mailing address _____

Affiliation _____

Telephone _____

Fax _____

Telex _____

The probability that I will attend the Conference is:

almost definite likely poor

I intend to present a paper a poster contribution
on the following theme(s):

Permafrost science
 Permafrost engineering

I would like to join the following post-conference tours:

Qinghai-Tibet Plateau
 Tianshan Mountains
 Northeast China

Number of accompanying persons:

Adults _____ Children _____

The accompanying person would like to join the following pre- and post-conference scenic tours:

	Pre-conference tour	Post-conference tour
South and central China	_____	_____
East China	_____	_____
Please send further information	_____	_____