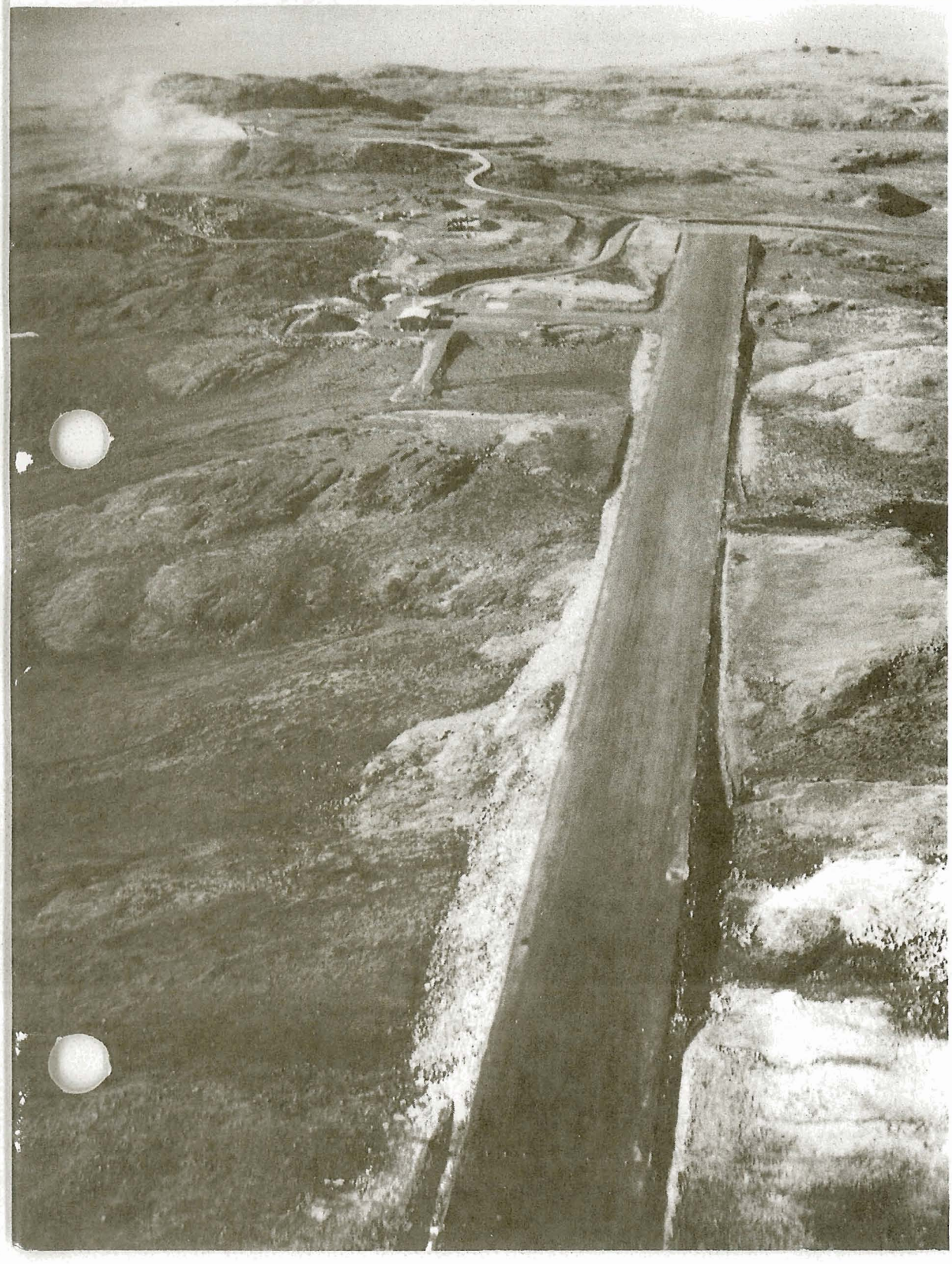
Frozen Ground

Number 7 The News Bulletin of the International Permafrost Association July 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.

Officers of the International Permafrost Association

President
Dr. T.L. Péwé
Department of Geology
Arizona State University
Tempe, AZ 85287-1404
USA
Tel: (602) 965-2883
Telex 156-1085 ASA UT
Fax (602) 965-8102

Vice President
Dr. V.P. Melnikov
Scientific Council on Earth Cryology
USSR Academy of Sciences
Fersman Street, 11
17312 Moscow
USSR Tel. 26726-385
Tel. 124-53-55

Vice-President
Professor Cheng Guodong
Lanzhou Institute of Glaciology and Geocryology
Academia Sinica
Lanzhou
China
Tel. 26726-385
Telex 72008 IGCAS CN

Secretary General
Dr. J. Ross Mackay
Department of Geography
#217 1984 West Mall
University of British Columbia
Vancouver, BC V6T 1W
Canada
Tel. (604) 228-2257 Or 2663
Fax (604) 228-6150

Adhering Member Countries

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

Cover photograph:

Salluit is an Inuit community on the south shore of Hudson Strait, in the eastern Canadian arctic, at latitude 62°15' north, longitude 75°30' west. The airstrip, which is being constructed as part of a program by the Québec Ministry of Transport to build airstrips at 12 native communities around the coasts of Nunavuk (formerly Ungava or Northern Québec), is at 220 m elevation of the plateau surface southeast of the community.

FROZEN GROUND
The News Bulletin of the International Permafrost Association

Number 7 **July 1990**

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. The two 1990 editions of *Frozen Ground* are to be edited 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. 8 is the end of October 1990. Please ensure that Working Group 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 address shown on the back cover.

Issue No. 7 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 Julie Gani.

Errata: Frozen Ground, No. 6, p. 13, Denmark - Sweden was inadvertantly omitted from the list of participants at the International Symposium on Geocryological Studies in Arctic Regions.

IPA NEWS

President's Column

It is a pleasure to report that the International Permafrost Association is "coming of age". It is a fully alive, functioning, international organization. This was demonstrated at the Executive and Council meetings, as well as at meetings of the Working Groups, all in association with the Fifth Canadian Permafrost Conference held in Québec City, Canada during the first week of June, 1990. The Standing Committees created by the Council at Trondheim in 1988 have been busy permitting the IPA to move into mainstream international activities. For example, the Finance Committee has recommended a new dues structure to increase dues and to permit countries to pay at different levels. Our income must be increased to support the Secretariat after 1993, when the 10-year period of support by Canada will terminate. Also, funds were recommended to support activities of the Working Groups, stewards of our interconference activities.

The Editorial Committee has seen to the creation of an enlarged and formalized IPA news bulletin, *Frozen Ground*, which is distributed around the world placing our name and science and engineering activities up front, especially to countries with interests in high latitudes and high altitudes. Also, plans are being formalized for a standard review of papers contributed for the Sixth International Conference to be held in 1993 in China. A new project recommended and now under way is the plan to create and publish a formal permafrost map of the northern hemisphere.

As with most international scientific and engineering organizations, the promotion of frozen ground activities of the IPA, especially in inter-conference periods, is by actions of Working Groups. It is gratifying to report that the Working Groups created in 1988 at Trondheim have "grabbed the ball and are running hard" and would be a credit to any organization for their initiative and progress exhibited in their first 2 years. Such details are reported later in the news bulletin, but I would like to present a few notes here of some of the vigorous actions of these groups.

The organization of a major volume of papers on Permafrost and Global Change is being planned for completion in 1993 by the Global Change Working Group. Also, the group is compiling a bibliography of papers on the subject to be released as an Open File Report by the Geological Survey of Canada. The Periglacial Working Group has organized a high mountain permafrost workshop in Switzerland for 1991, in cooperation with the Mountain Permafrost Working Group. They have issued two editions of the Working Group Circular which announced several periglacial excursions over the next 3 years. Foundation Engineering lists a workshop in Norilsk City in 1991. Data and Information and Terminology Working Groups are preparing publications on a multilingual permafrost glossary and data presentation respectively.

As reported in News Bulletin No. 6, we are now an affiliate of the International Union of Geological Sciences (IUGS) and therefore have ties with the International Council of Scientific Unions (ICSU).

By the above review it has been demonstrated to me that the IPA is on its way toward becoming a mature international organization in the first 7 years of its existence since its founding at Fairbanks, Alaska. Much of its strength and background can be traced to the previous 20 years of preparation and the conducting of four international conferences on permafrost from 1963 to 1983.

Sincere congratulations are extended to the participants and leaders of the IPA Committees and Working Groups for increasing the stature of the IPA.

Troy Péwé
President

The 4th and 5th Meetings of the IPA Council were held in Québec City on 4-5 June 1990 in Québec City, Canada, in association with the Fifth Canadian Permafrost Conference. Full minutes of the meetings will be available in due course through Adhering National Bodies, and the formal reports of Standing Committees and Working Groups are presented separately in this issue of *Frozen Ground*. Several other matters of immediate interest to permafrost scientists and engineers are reported below. The Council Meetings were chaired by the IPA President, Dr. Troy L. Péwé (Arizona State University, USA), and were attended by representatives or observers from ten of the adhering countries.

IPA Membership

Since the last Council Meeting, Denmark has formally joined the IPA, and its representative was welcomed by the IPA President. The Danish Adhering Body is the Danish Society for Arctic Technology.

The proposed change in Sweden's status from Observer to full Member of the IPA was considered by Council, and was supported unanimously by voting members. Membership is now subject to ratification through a ballot of the remainder of the adhering countries. On an interim basis, the Swedish Adhering Body is to be the Physical Geography Department at Lund University.

Council would welcome suggestions for further adhering countries with a significant interest in permafrost. Proposals should be submitted to the Secretary General. The broadest possible international membership is vital to the success of the IPA in representing and co-ordinating the interests of the permafrost community. Starting from 1991, membership dues will be payable on a unit basis, with the number of units (maximum 12) being set at a level appropriate to each individual country. It is stressed, however, that voting rights and participation in IPA activities are not subject to a country's ability to pay dues.

International Affiliations

One of the major functions of the IPA is to present a co-ordinated representation of the interests of the permafrost scientists and engineers. To achieve this aim, the Association requires international affiliations which offer the status and communications necessary for an effective lobby.

In this context, a major recent event has been the unanimous support accorded by the Council of the International Union of Geological Sciences to the IPA application for affiliation at Washington DC on 15 July 1989. IUGS affiliation provides a direct relationship with the International Council of Scientific Unions. ICSU membership in turn represents for many countries the key to obtaining national support for membership dues, and offers enhanced status to the National Adhering Bodies.

Equivalent engineering affiliations are still being discussed. The possibility of affiliation to the World Federation of Engineering Organisations (WFEO) was considered at the IPA Council Meeting in Trondheim, Norway, in 1988. Subsequent negotiations have so far failed to identify an acceptable basis for affiliation. As an alternative the recently established "Corresponding Member" status may represent a viable interim approach to affiliation to the Union of International Technical Associations (UITA).

The proposed establishment of the International Arctic Science Committee (IASC) was welcomed by IPA Council as a most significant event. The IPA President and Secretary-General have undertaken to contact IASC to seek an early opportunity to explore ways in which IPA might offer a ready-made basis for supporting or co-operating with permafrost-related IASC activities. In addition a more formal association between the IPA and the International Commission on Snow and Ice (ICSI) is to be explored.

Sixth International Conference on Permafrost: Beijing 1993

The preliminary program of preparatory stages announced in *Frozen Ground 6* was confirmed and amplified at the Council Meeting. Beijing is clearly the place to be for cold regions scientists in the 1990s: INQUA in 1991, International Glaciological Society in 1992, and - the main attraction for the permafrost community - IPA in 1993! To be precise, 5-9 July 1993 should now be firmly entered in the diaries of all permafrost scientists and engineers, together with an allowance for one of the three related Field Trips. The count-down is already underway on the following schedule.

November 1990	First Announcement
August 1991	Call for Papers (Abstracts)
February 1992	Authors informed of acceptance of Abstracts
June 1992	Manuscript submission deadline
November 1992	Paper review process completed
December 1992	Second circular
March 1993	Deadline for revised camera-ready text
April 1993	Registration deadline

In the meantime, activity focuses on the establishment of the local Organizing Committee chaired by Cheng Guodong (IPA Vice President), and the confirmation of the funding and sponsorship base. The conference language will be English, and full proceedings will be published. The Chinese Organizing Committee will be supported for the purposes of the review of submitted manuscripts by the IPA Editorial Committee.

Multiple Meetings

International meetings for the exchange of information lie close to the heart of the IPA's remit, but a multiplicity of meetings can be an embarrassment. A glance at the Calendar at the end of *Frozen Ground* suggests that cold regions specialists now face conflicting choices which are beginning to become self-defeating. Too few participants at too many meetings decreases the effectiveness of the information exchange, and the financial viability of the organizations concerned.

What can be done about this? The IPA Council has affirmed that meetings of its component groups should not compete with the International Permafrost Conferences. In addition, it has asked its Working Groups to co-ordinate their proposed meetings schedules through the Secretary-General so as to avoid conflicts. As far as non-IPA meetings are concerned, there is much less potential for avoiding clashes in timing and venue. However, co-ordination and opportunities for joint or associated meetings will be sought wherever possible.

Future meetings of the IPA Council have been provisionally proposed in association with the XIII INQUA Congress (Beijing, August 1991) and the Sixth International Permafrost Conference (Beijing, July 1993). In addition, it is expected that Executive Committee and Working Groups might meet in association with the IGU Congress (Washington DC, August 1992).

A Strategy on Publishing

IPA Council is keen to maximize the benefits of widespread publication whilst avoiding fragmentation or duplication of effort. The News Bulletin *Frozen Ground* will be edited and produced through the GeoData Institute (Southampton University, UK) for two issues (7 and 8) while alternative formats are explored - perhaps involving a commercial publisher or a link with an established Journal. *Frozen Ground* will be published nominally in June and November, though these dates will be adjusted in response to major events where appropriate (as with the Canadian Permafrost Conference).

While individual Working Groups will continue to circulate their own news sheets to group members, it is hoped that all significant news or opportunities will be reported to the IPA as a whole through *Frozen Ground*. This wider reporting is essential if the Association's activities are to benefit the permafrost community at large.

Several Working Groups are also preparing to publish monographs or books. Details are presented in the individual reports, but highlights include a volume on *Permafrost and Climatic Change*, another on *Permafrost Data and Information: New Horizons*, together with an *Annotated Bibliography on Permafrost and Climatic Change*, an updated *Permafrost Bibliography 1988-92* (WDC-A for Glaciology), and an updated *Index to Permafrost Conference Volumes* (Geological Survey of Canada). Where appropriate, this program of publishing will be co-ordinated by IPA to provide maximum cumulative effort.

Finally, a publishing project of very great significance is the proposed production under the auspices of the IPA of a *Circum-Polar Permafrost Map*, perhaps at a scale of 1:7500000. This would involve a major co-ordination between mapping groups from different arctic nations, but would yield an invaluable baseline document for planning purposes and for assessment of global environmental change. A detailed proposal is to be formulated over the next six months with a view to commencing compilation in 1991 so as to permit the map to be completed for the Sixth International Permafrost Conference. The project is being co-ordinated at this stage by Jerry Brown and project sponsorship being sought. It is hoped that the map will be published by one of the national mapping agencies.

Mike Clark

IPA RESOLUTION

(Approved 6 June, 1990 at IPA Council Meeting, Québec City, Canada)

WHEREAS the distribution and properties of permafrost are of increasing interest to non-permafrost specialists, and particularly to those concerned with assessing the impacts of climate change on northern regions;

WHEREAS regions underlain by permafrost and containing organic rich soils are potential sources and sinks of radiatively active trace gases (carbon dioxide, methane, etc.) that contribute to the greenhouse effect;

WHEREAS no single, circumpolar map exists at a scale and with a common legend useful for observing, depicting, or assessing the proposed changes in permafrost degradation and other biogeographic zonation (scale of approximately 1:7,500,000);

WHEREAS an understanding of permafrost distribution and properties is important to the protection of the northern environments for both development and conservation purposes;

Be it RESOLVED that the IPA, consisting of 18 adhering national bodies, undertake the compilation, editing and production of a circumpolar map depicting the current knowledge on permafrost distribution and boundaries in the Northern Hemisphere;

FURTHERMORE, the IPA notify other international and national scientific and engineering organizations that such a project has been initiated and that their cooperation and interest are welcome;

Finally, be it RESOLVED that the IPA establish the organizational mechanism and schedule to produce this map prior to the Sixth International Conference on Permafrost to be held in Beijing in July 1993.

PERMAFROST AND PERIGLACIAL PROCESSES

A new journal from John Wiley under this title is edited by H.M. French, E.A. Koster and A. Pissart. The first issue is now available and includes papers on recent ice-wedge developments in the Yukon Territory; growth and deformation of ice-wedges; buried glacier ice and massive segregated ice, Western Arctic coast, Canada; permafrost and groundwater conditions, N.E. China; segmentation in the profile of alpine talus slopes; mechanical weathering rates on Signy Island, Maritime Antarctic; and, apparent hydraulic conductivities associated with thawing frost-susceptible soils. For further information contact:

Julie Morgan
John Wiley and Sons Ltd.
Baffins Lane
Chichester, West Sussex,
PO19 1UD, UK.

IPA STANDING COMMITTEES AND WORKING GROUPS

IPA Policy is set by its Council and Executive Committee, but much of its formal business is conducted by three standing committees: Finance, Editorial and Working Groups. The Working Groups themselves are approved by Council for a five year period linked to the cycle of the International Permafrost Conferences, and may subsequently be extended for one further five-year period after a review. The membership details presented below are subject to minor alteration. Anyone interested in participating in the activities of a Working Group, perhaps as a Corresponding Member, should contact the Chair or Secretary. The Working Groups are overseen by a Standing Committee of the IPA, which is preparing a report on their status and future expectations for Council by December 1990.

Mountain Permafrost

Purpose: To improve the exchange of information on, describe the state of knowledge about, and stimulate research activities concerning permafrost at high altitudes and in rugged topography, especially at low latitudes.

W. Haeberli, Chairman, Switzerland
F. Dramis, Secretary, Italy
G.D. Cheng, China
A. Gorbunov, USSR
J. Giardino, USA
S. Harris, Canada
corresponding members:
D. Barsch, Germany
A. Corte, Argentina
M. Evin, France
G. Patzelt, Austria
J. Sollid, Norway

The Working Group is now fully established.

The main goals of the planned activities are to (1) improve the exchange of information, (2) describe the state of knowledge and (3) stimulate further research concerning permafrost at high altitudes and in rugged topography, especially at low latitudes. Special attention will be given to the study of permafrost creep/rock glaciers, a topic which has received strongly increased attention during the past years. Communication up to now is by correspondence and a specially designed circular.

In collaboration with the IPA Working Group on Periglacial Environments an international workshop on PERMAFROST AND PERIGLACIAL ENVIRONMENTS IN MOUNTAIN AREAS will be held in Interlaken (Switzerland) from 16-20 September 1991, organized by the Laboratory of Hydraulics, Hydrology and Glaciology, Federal Technical Institute, Zurich (VAW/ETHZ). The steering committee is composed of the members of the two working groups.

Topics for discussion will be:

Distribution of mountain permafrost;
Mapping periglacial landforms in mountain areas;
Prospecting methods for mountain permafrost;
Permafrost creep on steep slopes: rock glaciers;
Permafrost/glacier-relationships;
Mountain permafrost and climatic change;
Natural hazards from periglacial mountain belts;
Effects of touristic developments on perennially frozen slopes;
Construction in mountain permafrost.

The program includes presentations of reviews and of results from recent work, free and round-table discussions, a 1-day tour during the conference to the nearby Jungfraujoch (construction in permafrost, scientific research station) as well as a preconference tour to research sites in the French and Swiss Alps (M. Evin, W. Haeberli) and a postconference field excursion to the Swiss, Austrian and Italian Alps (C. Smiraglia, G. Patzelt, W. Haeberli). Publication of the Workshop contributions is planned shortly after the conference. Field guides will be available for the excursions. The number of participants is limited to 50. One of the important tasks of the workshop will be to consider internationally coordinated efforts to initiate standardized long-term monitoring programs (borehole measurements, high-precision photogrammetry, geophysical baseline information) in view of possible impacts of climatic change on mountain permafrost and slope stability.

A first circular is being distributed now and a second circular giving details of excursions, accommodation and costs will be distributed early in 1991.

Terminology

Purpose: The Terminology Working Group was organized in the fall of 1988, after the Fifth International Permafrost Conference, to develop a set of internationally accepted permafrost terms for use in both engineering and science, with equivalents in various languages, and to disseminate and encourage the use of such terminology.

R.O. van Everdingen, Chairman, Canada.
N.N. Romanovskiy, Secretary, USSR.
R.G. Barry, USA.
A.E. Corte, Argentina.
O.J. Ferrians, Jr., Alaska.
J. Karte, Germany.
Q. Guoqing, China.
M. Seppälä, Finland.

Spanish equivalents of the 201 primary terms in the Glossary of Permafrost and Related Ground-Ice Terms have been produced by Arturo Corte and co-workers, who also suggested alternatives for a few of the terms.

Using the English, French and Spanish versions of the Glossary, and the German translation of the 1974 Permafrost Terminology (Brown and Kupsch), made by Johannes Karte in 1982, a preliminary multi-lingual index has been prepared for the 201 primary and 57 secondary terms in the Glossary.

Oscar Ferrians is selecting terms from the NRCC Glossary that require refinement or redefinition to eliminate ambiguity and confusion.

Several items dealing with permafrost terminology have been prepared in China:

a. a Chinese-English booklet entitled "Geographical Terms", published by the Science Press in February 1989, lists 1428 terms, including 47 in glaciology and 30 in geocryology.
b. a short paper by Qui Guoqing, introducing the NRCC Glossary, is to be published in the Journal of Glaciology and Geocryology in spring 1990.
c. the Geography Volume of the Chinese Encyclopedia, to be published in the near future, covers a number of terms in geocryology, including permafrost, seasonally frozen ground, talik, ground ice, frost action, periglacial geomorphology, groundwater in permafrost regions, rheology of frozen ground, etc.
d. a geocryology glossary with 440 entries, Chinese explanations, and a Chinese-English-Russian term list has been prepared, but publication will likely be delayed due to financing problems.

In the USSR, work on the translation of the NRCC Glossary is in progress, with additional Russian terms being added as required. This first phase is expected to be completed in 1990. In the second phase, to be carried out by 1992, a number of the terms will require further comments in the Russian version because they are used in a slightly different sense in the Soviet Union. It has been suggested that these additional comments should be translated into English in Canada.

No progress on the translation or adaptation of the Glossary has been reported from Scandinavia.

It is assumed that the eventual product of the efforts of the Terminology Working Group will be either a multilingual glossary of permafrost terms, or a multilingual index. Preliminary decisions on where, when and in what form it should be published should be discussed in the near future, to enable early adoption of appropriate style, organization, and word-processing formats. Sample as follows:

active layer
FR - mollisol
GE - Auftauboden/Mollisol
SP - capa activa
active layer, relict
FR - paleomollisol
GE - Auftauboden, reliktisch/Paläomollisol
SP - paleo-capa activa
active-layer failure
FR - rupture de mollisol
GE - Auftauboden-Rutschung
SP - ruptura o deslizamiento de la capa activa

Foundations

Purpose: To collect information on the practice of foundation engineering in various permafrost regions of the world and to synthesize guidelines for effective engineering practice. The Working Group would also encourage monitoring and reporting of the performance of foundations in permafrost.

P.I. Melnikov, Chairman, USSR.
K. Flaate, Secretary, Norway.
R. Tart, US.

The Working Group held a meeting in association with the Fifth Canadian Permafrost Conference at Laval University, Québec City, on 7 June 1990. The future activities of the Working Group were discussed, and will include a review of norms for arctic foundations for the USSR in the light of global climatic change. This will be the subject of a Workshop at Norilsk, USSR, in 1991. A second more general Workshop on construction engineering implications of climatic change may be developed as a joint USA/Canadian venture for 1992.

Present Global Change and Permafrost

Purpose: To identify the effects and consequences of global changes in temperature and related phenomena upon the nature of permafrost and its distribution. The Working Group would be encouraged to interact with other national and

international groups concerned with global change (e.g. IGBP, IPCC).

E.A. Koster, Chairman, The Netherlands.
A.S. Judge, Secretary, Canada.
D.W. Hayley, Canada
A.E. Corte, Argentina
W. Andres, FRD
A. Rapp, Sweden
W.C. Oechel, USA
T. Osterkamp, USA.
C. Guodong (ex. off.), China
H.M. French (ex. off.), Canada

Prof. Dr. J.P. Lautridou (University of Caen) and Dr. C. Harris (University of Cardiff), Chairman and Secretary respectively of the IGU/IPA Commission on Frost Action Environments, have been contacted to ensure cooperation between this commission and the Working Group on Present Global Change and Permafrost and to distribute news about the activities of the Working Group through the Commission's newsletter.

After consultation with Hugh French, Alan Heginbottom and Alan Judge (Ottawa) and Jerry Brown (Washington) it has been decided to prepare a monograph on Permafrost and Climatic Change, to be published as a special (double) issue of the Journal of Permafrost and Periglacial Processes (John Wiley) in 1991. A preliminary outline has been drafted and circulated to various colleagues. Suggestions for topics to be addressed and for potential authors have been received. A final outline was discussed at the Canadian Permafrost Meeting in Québec (June 1990).

A preliminary version of an Annotated Bibliography on Permafrost and Climatic Change has been prepared. This draft has been circulated to various colleagues. It has been suggested that an upgraded version of this bibliography should be published as a Geological Survey of Canada Open file Report. A final draft was discussed at the Canadian Permafrost Meeting in Québec.

Contributions have been made to the IPCC report on "Environmental impacts and socio-economic consequences of climatic changes for seasonal snow cover, ice and permafrost", co-chairmen: R. Street, Canada and P. Melnikov, USSR.

A review on "*Assessing the effects of climatic change on permafrost*" has been prepared, which is presented at the Royal Geographical Society Meeting in London (May, 1990) and which will be published in a Blackwell volume on "*Geographical perspectives on global environmental change*" in 1991.

The IPA Working Group on Present Global Change and Permafrost had a meeting on Friday 8 June, 1990 at the Canadian Permafrost Meeting in Québec to discuss the final membership of the Working Group, the above-mentioned proposals and other future activities of the Working Group.

Data and Information

Purpose: To improve and standardize the collection, archiving, documentation and dissemination of permafrost data. The Working Group will collaborate with the Working Group on Permafrost Terminology and with other national and international committees and agencies concerned with relevant data.

M.J. Clark, Chairman, UK.
R.G. Barry, Secretary, USA.
Bangjun Wu, China.
N.A. Grave, USSR.
A. Heginbottom, Canada
B.F. Molnia, USA.

The IPA Working Group on Permafrost Data and Information was established following a Workshop on the same theme organized by World Data Center-A for Glaciology (Snow and Ice) in conjunction with the Fifth International Conference on Permafrost held in Trondheim, Norway, in 1988. The Workshop recognized that there are only isolated examples of formal national programs to collect, standardize, archive and disseminate permafrost-related data, and that international co-ordination in this respect was rudimentary. This state of affairs was regarded as seriously disadvantageous, given the importance of high quality data for comparative and integrated studies, particularly those which seek to establish sometimes-subtle global patterns and trends.

Since the aim of the Working Group is to co-ordinate existing national efforts and to recommend standards or procedures for discussion by other subject-based groups, it has not sought a large membership and does not propose to act through major stand-alone meetings. Rather, its intention is to collaborate with the Working Group on Permafrost Terminology and with other national and international committees and agencies concerned with relevant data. The present core membership of the Working Group is given at the head of this report.

In addition, three corresponding members are being invited to participate in the Working Group's activities in relation to each of a series of specific themes including global change, soils, hydrology and engineering design. The first formal meeting of the Working Group was held at the US Geological Survey (Reston, Virginia, USA) in December 1989. The Group expects to meet annually or bi-annually. A second meeting was held in association with the Fifth Canadian Permafrost Conference at Laval University, Québec City, on 8 June 1990. It was agreed to propose a Workshop on Permafrost Data Standards and Conventions, possibly to be hosted by the

Geological Society of Canada in May 1991. This would identify a framework for producing a preliminary set of guidelines for discussion at Beijing in 1993. The Working Group also undertook to investigate information archiving possibilities on behalf of the Working Group on Present Global Change and Permafrost. A major presentation and debate will be arranged for the Sixth International Conference on Permafrost (Beijing, 1993), and in support of this meeting it is proposed to publish a volume provisionally titled *Permafrost Data and Information: New Horizons.*

One of the primary aims of the Working Group is to achieve maximum communication with the permafrost community on matters concerning data standards. In part this will take place through the IPA bulletin *Frozen Ground* but in addition the potential for developing an E-mail bulletin board for permafrost matters is under investigation. The Working Group will encourage the submission of dataset descriptions to the Arctic Environmental Data Directory, and of datasets to WDC-A for Glaciology.

Working Group members were given a demonstration of the CD-ROM Arctic Environmental data series which it is expected will appear regularly from the US Geological Survey. The possibility of incorporating selected permafrost glossaries and datasets will be explored and the potential for undertaking GIS/mapping manipulation of any georeferenced data distributed in this form is also under review.

The Working Group has expressed support for the preparation of a 1988-92 permafrost bibliography by WDC-A Glaciology in readiness for the Sixth International Permafrost Conference, and the funding for such a project was discussed by IPA Council. It has also been agreed that it would be worthwhile for A. Heginbottom (Geological Survey of Canada) to update the indexed permafrost conference volumes which currently covers the period 1958-83. Cumulative indices for both these projects could be included on future CD-ROMs, and both projects have been supported by IPA Council.

At its first formal meeting, the Working Group discussed the perceived need for a coordinated approach to international mapping projects relating to arctic latitudes. The production of coherent and standardized maps including permafrost related material was regarded as a high priority. Following the June 5 IPA Council Meeting, the Working Group chairman is a member of the *ad hoc* group charged with refining a formal proposal for a Circum-Polar Permafrost Map (for further details, see the report on the Council Meeting).

Having set up its basic lines of communication, the Working Group will concentrate over the next year on increasing the flow of information concerning permafrost data, and on commencing the process of reviewing permafrost data collection and archiving standards and procedures.

Periglacial Environments (IPA)

Purpose: To promote geomorphological research related to permafrost.

J.P. Lautridou, President, France.
C. Harris, Secretary, UK.
S. Kozarki, Poland.
B. Hallet, USA.
H. French, Canada.
A. Pissart, Belgium.
M. Seppälä, Finland.
J. Vandenberghe, The Netherlands.
R.O. Van Everdingen, (Ex Officio) IPA Terminology Working Group

The IPA Working Group on Periglacial Environments, was established to promote geomorphological research related to permafrost.

Reports on meetings:

Polar Geomorphology (Bremen, 30 August - 1 September 1989): ICG Symposium No. 5, 1st Working Meeting of IGU Frost Action/IPA Periglacial Environments Commission (M.G. Marcus and G. Stablein). 38 scientists from 16 countries participated in this conference. The conference included a visit to the Alfred Wegener Institute for Polar and Marine Research. Papers were presented in the following sessions: Polar Climate and Environment, Polar Glacial Geomorphology, Polar Projects of the AWI (Bremen).

Polar Periglacial Geomorphology: Quaternary Climatic Changes in Polar regions. Papers will be published in (1) a special issue of the new journal *Permafrost and Periglacial Processes* (Publishers Wiley, Chichester, UK) and (2) a special issue of *Zeitschrift fur Geomorphology*. Editors of both publications are H. French, M. Marcus and G. Stablein.

Cold Climate Geomorphology (joint BGRG/IPA Working Group/IGU Commission Meeting, 23-24 September 1989): 70 participants with 33 papers presented in the following sessions: Periglacial Processes and Landforms, Glaciofluvial and Glaciolacustrine Sedimentation, Regional Studies, and General Geomorphology. Abstracts of papers available from C. Harris, Cardiff.

Quaternary Engineering Geology (10-14 September 1989, Edinburgh): 25th Annual Conference of the Engineering Group of the Geological Society. The meeting included a one-day session on Periglacial and Slope Processes, which was opened by Professor J.N. Hutchinson with a theme lecture.

Papers were presented on the following topics: Quaternary periglacial slope deposits in SW England (M. Gallop), Late and post glacial slope development near Ironbridge, Salop, UK (T.P. Gostelow *et al*), Influence on coastal cliff stability of changes in sea level and climate (P.G. Kalaugher and P. Grainger), Identification of former permafrost in the North Sea (D. Long), Possible mechanisms of valley bulging (C.D. Parks), Solifluction shears at Carsington, Derbyshire (A.W. Skempton *et al*) and Periglacial discontinuities in Eocene clays near Denham, Bucks, UK (T.W. Spink). These and other papers from the meeting will be published in the Conference Proceedings.

Geocryology of the Americas (16-20 October 1989, Mendoza, Argentina) (A. Corte): 1st meeting of IGCP 297, in collaboration with IPA Working Group/IGU Commission. 45 participants from 11 countries. 37 papers were presented, to be published in *Acta Cryogenica*. 2 excursions to the Andes.

Business Meetings of the IGU Frost Action Commission/IPA Periglacial Environments Working Group were held in Frankfurt during the International Geomorphological Congress, and during the Mendoza meeting.

Commission on Frost Action Environments (IGU)

The Commission on Frost Action Environments was established at the IGU Congress in August 1988 and will continue the work of the former Commission on the Significance of Periglacial Phenomena, promoting research into periglacial sediments. The Commission and the IPA Working Group on Periglacial Environments will operate jointly in promoting meetings, field excursions, discussion sessions, research initiatives, and in providing a source of information on periglacial research. The primary aim will be to study, in both field and laboratory, the dynamics of the processes associated with frost action, and the nature of the landforms and sediments which result. A periodic Newsletter is being issued.

J.P. Lautridou, President, France.
C. Harris, Secretary, UK.
M. Allard, Canada.
Cui Zhiju, China.
A. Velichko, USSR.
K. Hall, South Africa.
C. Thorn, USA.
Y. Ono, Japan.
H. French, Canada, (Ex Officio) INQUA.
E.A. Koster, The Netherlands, (Ex Officio) IPA.

IPA Editorial Committee

Members of the Committee met informally in Yamburg, Siberia, in August 1989, while participating in the International Symposium on Geocryological Studies in Arctic Regions, and at Québec City, June 1990. Members present at Yamburg were Brown, French, Cheng, Grave and Péwé, *ex officio*, and at Québec, Brown, French, Cheng, Clark, Koster and Péwé. Also present for several discussions were P.I. Melnikov and V.P. Melnikov. Two major topics were discussed: the IPA News Bulletin and the review procedures and schedule for producing the Proceedings of the Sixth International Conference on Permafrost.

At Yamburg there was agreement that in order to have IPA better known, particularly now that it was an affiliate member of the International Union of Geological Sciences, a more formalised newsletter would be appropriate. Working closely with members of the Editorial Committee and the Executive Committee the Chairman prepared and distributed 1000 copies of the newly formatted *Frozen Ground*: The News Bulletin of the International Permafrost Association, No. 6.

A number of issues relating to the News Bulletin received Council attention at Québec City in June 1990. Council approved two issues per year. Substantial news information is required from each adhering body or individual researchers to justify the time and expense involved in preparing and distributing the News Bulletin. The Editorial Committee will be responsible for preparation of the Bulletin. Mike Clark, Chairman of the Data Working Group, was added to the Editorial Committee and has agreed to be Guest Editor for the next two issues. Distribution of the News Bulletin was discussed. Currently copies are bulk mailed to each Adhering Body for internal distribution at no cost to recipients. Although this insures distribution to active IPA and permafrost and periglacial communities in each country, it limits access to the broader geosciences and engineering communities and libraries. The International Glaciological Society charges a nominal fee for its bulletin ICE. A limited subscription basis would serve IPA long-term interests, and this possibility will be explored by members of the Committee.

The second item discussed at Yamburg and the Québec Council meeting was the schedule and review for abstracts and manuscripts for the Sixth International Conference on Permafrost. The schedule was published in *Frozen Ground* No. 6. Cheng indicated that China wants to publish the proceedings and would like the Editorial Committee's assistance in the review process. We agreed that: (a) only original papers will be published and (b) all papers would have comparable review. The Chinese would like the Committee to conduct a standard review of all

Chinese papers. In the event the Soviet papers cannot be submitted in advance, the Editorial Committee would receive at least two Soviet reviews for each Soviet manuscript prior to deciding on publication. The International Geographical Union (IGU) meeting will be held in Washington, DC in August 1992 and it is proposed to convene a review panel at that time to review the manuscripts. Details will be developed.

Also discussed was the possibility of publishing papers in journals prior to the Conference, presenting them at the Conference, and republishing them as part of the Conference proceedings. The objective would be to give authors wider circulation in peer reviewed journals. The Chairman contacted five or so journals and received mixed responses. Subsequently, an alternative was discussed with the Secretary-General of the International Glaciological Society who was willing to consider a special, post-conference IGS volume of selected papers that were published in the Chinese permafrost proceedings. This would give wider circulation to a select group of papers. Selection of these papers could be made at the Conference. Although there is no agreement to proceed with this proposal, it is still under discussion.

Members of the Council and Committee were briefed on the status of the new Soviet Permafrost Journal.

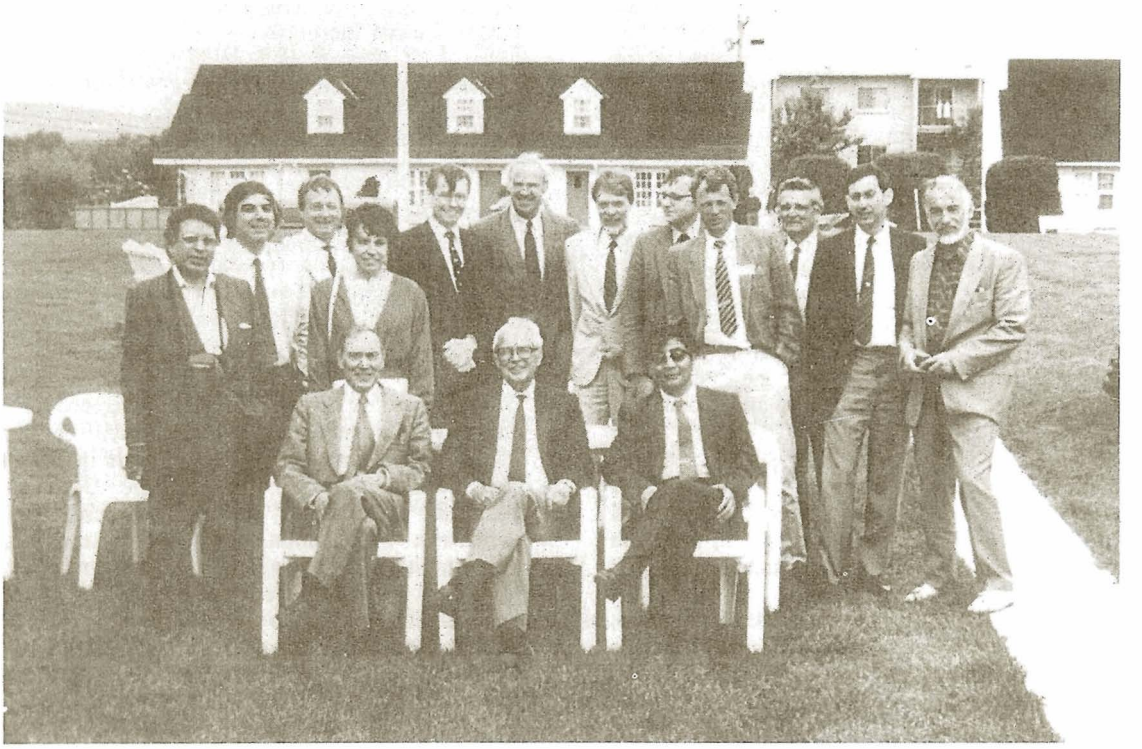
The Committee considered a proposal by P.I. Melnikov for IPA sponsorship of a multi-authored monograph on *Geocryology of the World.* Although no definitive opinion was reached, the Committee is agreeable to participate in a discussion at the Council meeting. The Chairman met with members of the Data Working Group at the US Geological Survey, Reston, Virginia, USA, and discussed areas of common interest (see Data Group's report). Finally, the Committee notes the recent publication of the complete volume series by E.D. Ershov, *Geocryology of the USSR* (see Miscellaneous item).

In summary, the Editorial Committee requested and received direction from Council at Quebec to:

(1) Prepare and distribute semiannually the *Frozen Ground* using IPA funds.

(2) Explore cost-effective options to produce and distribute future issues of the News Bulletin in order to reduce financial burden on the IPA and attain wider circulation.

(3) Establish the review process for the Sixth Conference to center on the August 1992 IGU meetings.



Members of the Council of the International Permafrost Association present at the meeting at Québec City, Canada, on 5 June 1990.
Front row: J.R. Mackay (Canada) - Secretary General, T.L. Péwé (USA) - President, G.D. Cheng (China) - Vice President

Canada

The Fifth Canadian Permafrost Conference was held at Laval University, Quebec City from 5 to 8 June, 1990. In this three-day period, 51 papers were presented on various topics in permafrost science and permafrost engineering, and several poster presentations were also shown. Nearly all the formal presentations were given by Canadian authors and the conference organizers made an effort to encourage the submission of papers by young Canadian scientists and engineers. The papers and posters have been published as No. 54 in the *Collection Nordicana* series of the Céntre d'études nordiques, Laval University, with the general title "PERMAFROST - CANADA; Proceedings of the Fifth Canadian Permafrost Conference".

The conference volume was dedicated to Mr. G.H. (Hank) Johnson, a permafrost engineer of many years experience who recently retired from the National Research Council of Canada. Mr. Johnston was also the Honorary President of the conference. The conference opened with a retrospective look at permafrost research in Canada, given by Johnston and a review of the current program of airport construction and permafrost research in northern Québec, given by Mr. Clement Tremblay of the Québec Department of Transport. The papers were grouped into theme sessions: geocryology, geophysics, hydrology, processes, thermal regime and climate change, and engineering. The conference concluded with a one-day engineering speciality session, convened jointly by the Permafrost Subcommittee of the National Research Council of Canada and the US Permafrost Committee. This session ended with a panel discussion on research needs and priorities in permafrost engineering. A noteworthy feature of the conference was that all the papers on the program were given, and with a minimum of substitutions of presenters.

In all, 146 people registered for the conference; of these 98 were Canadians (or foreign graduate students at Canadian universities). The largest foreign delegation, with 22 members, was from the USSR - this is the largest Soviet permafrost delegation ever to visit North America. The American delegation comprised 15 and 8 other countries were represented. The very large Soviet delegation was made possible because of the generous financial support of Laval University, which contributed towards the attendance costs for some 15 young Soviet permafrost scientists and engineers.

The success of the conference is a tribute to the organizing committee and, particularly, to its chairman, Professor Michel Allard, Laval University. The conference was sponsored by the Permafrost Subcommittee, National Research Council of Canada; the Cold Regions Geotechnology Division, Canadian Geotechnical Society; the Canadian National Committee for the International Permafrost Association; the Centre d'études nordiques, Laval University and the Ministère des transport du Québec. Financial support was also received from Air Inuit Ltée and Kodak Canada Inc.

Copies of the volume of papers from the Fifth Canadian Permafrost Conference may be purchased, at $40 Can per copy including postage, from:

Collection Nordicana
Centre d'études nordiques
Université Laval
Cité universitaire
Québec, Canada
G1K 7P4.

On the three days prior to the conference, the Executive Committee and the Council of the International Permafrost Association held meetings (see detailed account), as did the Canadian National Committee for the International Permafrost Association, and the Permafrost Subcommittee of the National Research Council of Canada. In the case of the Permafrost Subcommittee, this was its last meeting, as the Subcommittee and its parent body, the Associate Committee on Geotechnical Research, will cease to exist in their present form at the end of March 1991. How the work of the Subcommittee will be carried forward is still to be decided.

China

During 1989 a delegation from the Chinese Academy of Sciences visited the Mongolian Academy of Sciences, where the Director of the Institute of Glaciology and Geocryology expressed interest in joint permafrost studies with Chinese geocryologists. An invitation to attend the Sixth International Symposium on Ground Freezing, to be held in Beijing on 10-12 September 1991, is to be sent to the Mongolian Academy of Sciences.

A joint Sino-Soviet joint expedition to the Chinese and Soviet sides of Tien Shan will take place from June to September 1990. Five scientists from the Soviet Union will take drilling equipment to the Chinese Tien Shan to work on mountain permafrost, and three Chinese scientists (including IPA Vice-President Cheng Guodong) will visit the Soviet Tien Shan. The study will yield a joint monograph titled *Permafrost in Tien Shan.*

Discussions are under way concerning a joint Sino-US project to drill a 250 m deep borehole on the Qinghan Xizang plateau. This proposal is regarded as offering a major contribution to research on global change and permafrost, and the plans should be consolidated through a visit to China by Professor Osterkamp in October 1990.

Zhu Yuanlin reports that a new cold region science research centre - the *State-Major Frozen Soil Engineering Laboratory (FSEL)* is under construction at the Lanzhou Institute of Glaciology and Geocryology, Academia Sinica, and is scheduled for completion at the end of 1992. With a wide range of analytical instrumentation, the main aim of the laboratory will be to investigate the physical, mechanical and physico-chemical processes of freezing, thawing and frozen ground, together with their application to engineering practice and environmental research in cold regions. Research will focus on the mechanism of mass transfer and ice formation during soil freezing and thawing; frost heave processes, forces and prediction; thaw consolidation processes and thaw settlement prediction; creep and strength behaviour of frozen soils under various loading modes and stress states; thermal creep behaviour and freezing point depression under loading of frozen soils; simulation of temperature and stress fields for various structures on and in frozen subsoil under various boundary conditions; and principles and techniques relating to frost damage prevention, the thawing of frozen soil, and the applications of natural cold energy. The Laboratory will be pleased to accommodate postgraduate studies from overseas scientists.

Following a decision by the ICSU Panel on World Data Centers in August 1988, World Data Center D (WDC-D) was established in China in January 1989, and comprises nine disciplinary centers. *WDC-D for Glaciology (Snow and Ice) and Geocryology* is operated by, and co-located with, the Lanzhou Institute of Glaciology and Geocryology (LIGG), Chinese Academy of Sciences, Lanzhou 730000, China. The Director is Professor Xie Zichu, Vice Directors are Professor Zeng Qunzhu and Professor Cheng Guodong, and the Executive Secretary is Assistant Professor Chen Xianzhang. Contact can be achieved through telephone (0931) 26725 Extension 251: Cable Lanzhou 0393: and Telex 72008 IGGAS CN. Planned data holdings will cover *Glaciology* (glacier inventory; glacial hydrology; glacial climatology; ice cores; polar ice sheets; river, lake and sea ice; ice chemistry; ice physical parameters; satellite imagery of glacial areas; engineering parameters of ice), *Geocryology* (permafrost distribution; permafrost temperature; profile data on permafrost geology; thermal and mechanical parameters of frozen soil; ground ice; satellite imagery of permafrost regions), *Snow Cover* (ground data; snow chemistry; snow avalanche and snowdrift; snow physical parameters; remotely-sensed snow data; engineering parameters of snow) and literature and map resources. WDC-D is open to visitors during normal working hours. Data listings are issued periodically, and data can be provided on magnetic media (for snow and ice reflection, and northern hemisphere snow cover) and in printed or microfilm format for other data types.

Federal Republic of Germany

The German Permafrost Group now has a membership of about 50 people, who will recieve a twice-yearly German-language newsheet to be distributed with *Frozen Ground.* Efforts are being made to increase participating contacts with colleagues in the German Democratic Republic.

A large expedition to Svalbard will take place in Summer 1990. About 50 participants will work at Liefdefjorden (Spitzbergen) from 1 June to about 1 September, with a research program including many permafrost topics. This project will probably be continued in summer 1991. Other activities are focused on artificial ground freezing, alpine permafrost, and the permafrost environment of the South Shetland Islands, Antarctica.

Finland

According to the rules, the National Committee on Permafrost Research and Technology in Finland works an IPA interconference period and the member organisations renominated their representatives in 1988 for the new committee. Dr. Matti Seppälä (Department of Geography, University of Helsinki) is continuing as Chairman and the new secretary is Mr. Martti Eerola of the Finnish National Road Administration Laboratory.

The following events took place in Finland in 1989: an international ISSMFE symposium "*Frost in Geotechnical Engineering*", held in Lapland in March, organised by the Finnish Geotechnical Society and Technical Research Centre of Finland (VTT) - the large proceedings volumes are available on request; the Committee had two meetings with discussions of frost and snow investigations in Finland; and, the National Road Administration Laboratory produced a film of frost on roads where some of the Committee members were specialists - the film was presented in Finnish TV programmes.

France

Interest in polar science and engineering is growing in France, and the Association Francaise du Pergelisol (founded in March 1988) includes both professionals and research workers. The Association's President is Dr J. Aguirre-Puente, Vice President Professor J. Malaurie, Secretary General Professor A. M. Cames-Pintaux, and Treasurer Dr J. P. Lautridou. General Assemblies of the Association have been held in January and December 1989, and another is planned for July 1990. Links between the industrial and research communities are promoted by CNRS, and the development of polar industries is encouraged. Polar research in France has traditionally focused on Antarctic co-ordination, but promulgation of Arctic research at a political level is now found. At Ministerial level there is a Franco-Canadian agreement which includes polar research (science and engineering). A symposium on polar engineering organized by the Club "Etudes Arctiques" in February 1989 was a product of such interests, and a further outcome of Franco-Canadian co-operation was a 2-day workshop on Cold Regions Technology held in Paris in March 1989. Other classic scientific research themes include permafrost on the Planet Mars, thermal behaviour of low temperature materials, and acoustics in frozen soils. The French permafrost community is seeking liaison with civil engineering associations.

Italy

The Italian Adhering Body of the International Permafrost Association is constituted of 36 researchers belonging to several Universities and Research Centres.

A systematic study of Italian rock glaciers by means of both aerial photographic analysis and field survey is still in progress. In this framework, geomorphological surveys of periglacial features were carried out in the Monviso area (Western Alps) together with french colleagues and in Valfurva (Western Alps); for these latter studies geophysical investigations were also executed on some rock glaciers. In addition,

fieldwork was carried out in the Valle d'Aosta (Western Alps) to determine the importance of soils for datings of geomorphological events (glacier changes, floods, landslides, debris flows, avalanches, solifluction, etc.) in an alpine environment. Moreover, some researchers of the Adhering Body participated in the last expedition of the Italian Antarctica Project and another two will collaborate in the next one (1989-90). The Group, together with colleagues from Switzerland and Austria, is also planning a post-congress excursion in the Eastern Alps for the Meeting of the IPA Working Group "Mountain Permafrost", organized by W. Haeberli for September 1991.

Japan

A meeting on the techniques of permafrost study was held on 22 March 1990 at the Institute of Low Temperature Science, Sapporo. 25 members assembled and discussed boring techniques for permafrost and long term data logging methods under cold environment conditions. The performances of three different models of solid state memory type recording systems were reported. Kadec system of Kona System Co. in Sapporo was tested at the temperature of -70°C and verified its performance under severe conditions. At east Antarctica this model was used by the Japanese Antarctica Research Expedition. JARE reported that two years' temperature data at one-hour intervals were obtained by this model.

Dr. Fukuda of the Institute of Low Temperature Science and his group undertook a field survey on the topic of permafrost occurrence in the Antarctic peninsula area with special relationship to global climatic changes. This field expedition was financially supported by the Ministry of Education of Japan, and was organized in cooperation with the University of Chile and the Instituto Antarctico Argentino. Four Japanese, two Argentine members and one Chilean member conducted their fieldwork at King George Island, Seymour Island and James Ross Island. At more than 30 locations, the electrical grounding surveys were made to locate the permafrost table there. The high solute concentration in permafrost layers was estimated from the results of the survey. Mr. T. Yoshikawa of the Graduate School of Environmental Science, Hokkaido University, conducted a field survey on the genesis of pingos in east Greenland. Based on pollen analysis of the sediments at the site, he concluded that one of the pingos originated about 4000 years ago. Mr. T. Koaze of Meiji University, Tokyo and his group will conduct the field survey on permafrost at Reindalen and Adventalenin in central Spitzbergen from early July until the end of August 1990. The main objectives are field observation of pingo growth, ice wedge cracking processes and observation of the solifulaction rate on the slopes. Seven people will join the field survey. Dr. K. Fujino of the Institute of Low Temperature Science will conduct a field survey at Tuktoyaktok Peninsula near MacKenzie delta both this summer and winter season. By previous survey, the distribution of massive ice in permafrost layers was estimated by means of boring exploration and ground radar profiling. They will collect frozen materials and ice cored samples for pollen analysis and fabric analysis. Based upon these data, they will attempt the reconstruction of palaeo-environment at that region.

Dr. Sone, Dr. Ishizaki and Dr. Fukuda conducted the field survey of permafrost occurrence in a lowland area in central Hokkaido where a ground ice body was excavated 10 years ago. The ice body with dimensions 12m long, 10m wide and 2m deep was covered with talus debris. For these 10 years long term ground temperature monitoring has been conducted. Group temperature profiles suggest the permafrost may exist under the talus deposit at the depth of 3m. Ground radar profiling and electrical grounding surveys were made at the site. The origin of local permafrost was discussed and reported at the meeting of the geocryological research group in Sapporo. The final report will be made in English in October. Dr. Takahashi and Dr. Sone made a bore hole survey at the site of palsas in Mt. Taisetsu. 6m long core samples were collected and subjected to detailed cross sectional analysis.

Switzerland

The main activity of the group which now consists of about 30 members concentrated on the discussion of the first analyses from the permafrost cores recovered by drilling through the

active rock glacier Murtel/Corvatsch in 1987. A corresponding national workshop took place at VAW/ETH, Zurich, on 24 February 1989, during which the results of the pilot analyses were presented and discussed together with preliminary results from other studies (borehole measurements, thermal analyses, flow considerations) of the interdisciplinary project. The reason for carrying out such pilot analyses was the simple but remarkable fact that Alpine permafrost constitutes a so far unaccessible and therefore still completely unknown "archive" of information. A summary of the presentations and discussions is now being published in order to document the state of understanding to coordinate further work.

Research projects of various institutes continue on permafrost and rock glacier mapping (Valaise, Grisons), borehole and core studies (rock glacier Murtel/Corvatsch), hydrology of mountain permafrost (Valais), permafrost/snow-interactions and avalanche protection in Alpine permafrost (Grisons), and photogrammetric long-term monitoring of selected rock glaciers (Valais, Grisons). Current engineering problems to permafrost in the Swiss Alps concern foundations of avalanche protection work, dams for protection against rock falls, stability of galleries for ski runs in creeping rocks and foundations for cable car construction. A major study on periglacial debris flows from the catastrophic 1987 storm events is now reaching completion and steps are being undertaken to establish a long-term monitoring program on the thermal and mechanical stability of Alpine permafrost in view of possible future warming trends.

The Swiss Coordinating Group on Permafrost will be responsible for the organization of the 1991 International Workshop in Interlaken of the IPA Working Groups on Mountain Permafrost and on Periglacial Environments.

UK

The UK Adhering Body has undertaken a number of activities in the field of conference organisation and participation through which to progress its permafrost interests. In part, these activities are incorporated within the reports of the IPA Working Groups on Permafrost Data and Periglacial Environments. A conference on cold climate geomorphology was organised at the University of Wales, Cardiff in September 1989 jointly with the British Geomorphological Research Group. This included some 33 papers covering glaciological and hydrological topics as well as geomorphology as such. More recently a contribution has been made to the significant national conference on Geomorphology and Global Warming held at the Royal Geographical Society, London, in May 1990.

Of great importance to the permafrost community of the UK, and indirectly of other countries also, has been the production and distribution by the UK Natural Environment Research Council of a major report on British Arctic Science Policy. This document lists and prioritises the themes considered to represent major arctic research requirements for the future and represents a significant focussing of British activities in northern latitudes. Its recommendations and their implications were discussed at a conference titled "*Britain in the Arctic: Current and Future Research Opportunities*" held at the Scott Polar Research Institute in April 1990. The conference was interdisciplinary and included reference to permafrost concerns. It was, for example, addressed by Jerry Brown (IPA Editorial Committee) on North American arctic research status. The keynote of the conference was an announcement by the Natural Environment Research Council of its provisional funding priorities for arctic science. A residential research base has been established by NERC at Ny-Ålesund (Svalbard), a special topic funding opportunity in tundra ecology has been announced, and suggestions for future special topics have been made, including sea ice studies, surging glaciers and ice sheet modelling.

USA

This report includes brief summaries of recent activities of individuals, agencies and professional organisations involved in frozen ground research. Reports from the field include the following: David Esch, Alaska Department of Transportation and Public Facilities, reports that the paved airfield at Deadhorse in northern Alaska suffered from excessive thawing and settlement during 1989.

Permafrost preservation beneath the Bethel Airport road is planned using an experimental installation of thermosyphons installed diagonally across the roadway in shallow trenches at 8-foot intervals. Tom Osterkamp, University of Alaska, continues measuring permafrost temperatures at about 20 sites between Prudhue Bay in northern Alaska to Valdez. Several sites are instrumented for TDR, neutron logging, heave and electrical conductivity. Laboratory studies continue on solute redistribution during freezing. Model development to simulate permafrost changes to palaeotemperatures is underway. A.L. Washburn, University of Washington, reports he is continuing his field work on Cornwallis Island, N.W.T., under the auspices of Canada's Polar Continental Shelf Project. The research focus is on patterned ground and mass-wasting, with background studies on glaciation and delevelling. T.L. Péwé, Arizona State University, and his Canadian colleagues, J.A. Westgate and B.A. Stemper, have concluded that loess deposition in the Fairbanks, Alaska area, began at least 3,000,000 years ago. These findings are based on isothermal plateau fission-track ages from the Gold Hill permafrost section. This section is being designated for its special scientific importance and protected with funds provided by the State of Alaska. Frederick Nelson, Rutgers University, edited a special symposium issue of *Physical Geography* 10(3), containing several papers on permafrost by Nelson and O.A. Anisimov, State Hydrological Institute, Leningrad. Nelson and Anisimov are conducting joint research on permafrost mapping and the effects of climate change on permafrost distribution.

K.A. Kvenvolden and T.S. Collett, US Geological Survey, report that publication of results and work continue on gas hydrates with collection of gases during drilling of the permafrost/gas hydrate stratigraphic interval at Milne Point, Alaska. O.J. Ferrians, USGS, continues to revise and update the 1:2,500,000-scale permafrost map of Alaska. George Cryc, USGS, reports continued progress on the Circum-Pacific Map Project with both the Geodynamic map and the Plate-Tectonic map being available during 1990. A special thematic Arctic Sheet depicting geographic features including permafrost is also in preparation.

The Cold Regions Research and Engineering Laboratory (CRREL) reports several field and climate related activities. Dan Lawson continued analysis of stable isotope variations in Alaskan ground ice and permafrost stability. Richard Haugen developed a regional matrix of estimated spatial and temporal air and ground temperatures from along the pipeline road. Virgil Lunarani acquired a dataset on pavement surface temperature in order to further develop relationships of surface energy balance and changes in temperature of permafrost. James Rooney, Ray Kreig and Duane Miller attended the Fifth Soviet Conference on Engineering-Geological Site Investigation in Permafrost in Magadan, during October 1989. The conference was hosted by the Northeast Engineering Surveys Trust and chaired by Eduard Ershov, Moscow State University. Return visits to Alaska for several Soviet organisers and participants from Magadan, Anadyr and Moscow are planned for spring and summer 1990.

The American Geophysical Union bestowed the 1989 Walter H. Bucher Medal upon Arthur H. Lachenbruch for his original contributions to basic knowledge of the Earth's crust. His many accomplishments in advancing permafrost science were recognised as part of the award.

The American Society of Civil Engineers published the proceedings of last year's conference on climate change in its quarterly Journal of Cold Regions Engineering. Several design monographs are in preparation by the Technical Council on Cold Regions Engineering (TCCRE) and include the following: Cold Regions Hydrology and Hydraulics, Arctic Foundations, and Roadways and Airfields. Several conferences are planned: The Sixth International Conference on Cold Regions Engineering focusing on engineering technology in the 21st century to be held in Hanover, New Hampshire, February 26-28, 1991; the Seventh Conference in Canada 1994; and the Society of Petroleum Engineers (SPE) sponsored International Arctic Technology Conference, Anchorage, Alaska, May 29-31, 1991.

The US Committee on Permafrost of the Polar Research Board, National Research Council, is reviewing the status of its recommendations prepared during the 1980s. The Committee participated in organizing several technical meetings including the ASCE climatic change workshop and its publication and is considering workshops on Antarctic permafrost and permafrost environments under conditions of global change. Members of the US Committee for IPA have completed their initial five-year terms of office and the new membership is under consideration at this time.

An International Symposium on Frozen Soil Impacts on Agricultural, Range and Forest Lands was held in Spokane, Washington, March 21-22, 1990. The Symposium grew out of more than ten years of intensive investigations concerning frozen soil impacts in northwestern United States and other northern regions. The work has been organized by the USDA Agricultural Research Service, Oregon State University, University of Idaho, and Washington State University. The Proceedings volume contains 43 papers and was published by CRREL as Special Report 90-1. For more information contact the symposium chairman, Keith Saxton, USDA, ARS, Pullman, Washington. Upon learning of the Symposium, the Chairman,

USC/IPA provided the organisers of the Symposium with information on IPA and copies of Frozen Ground No. 6.

The Transportation Research Board's Frost Action Committee met in Washington, D.C., on 8 January 1990. Details of its activities can be obtained from the Chairman, Thomas Kinney, or the Secretary, David Esch (ADTPF), University of Alaska, Fairbanks, Alaska, 99775).

The US Interagency Arctic Research Policy Committee is coordinating the development of a multidisciplinary data directory and a CD-ROM based storage and retrieval system. The Arctic Environmental Data Directory (AEDD) has approximately 300 entries. The CD-ROM will include the permafrost bibliographies published in conjunction with previous permafrost conferences (GD 14 and GD 21). Permafrost data entries from other countries are encouraged. Additional information is available from the IPA Data Working Group (Barry or Molnia) or J. Brown.

The report of the Workshop on Permafrost Data and Information held in conjunction with FICOP in Trondheim, Norway on 2 August 1988 was published in *Glaciological Data Report GD-23*. Copies can be obtained from Roger Barry, workshop organiser and report author and coeditor of *Glaciological Notes* (CIRES, University of Colorado, Boulder, Colorado 80309).

The Third International Conference on Ground Penetrating Radar was scheduled to be held in Lakewood, Colorado, 14-18 May 1990. Several papers on permafrost were included in the program. Additional information is available from Gart Olhoeft, US Geological Survey, PO Box 25046, DFC MS964, Denver, Colorado 80225-0046.

Copies of *Proceedings: Permafrost Fourth International Conference* Volume 1 only, 1524 pages, are still available for $US 45.00 from Bruce Molnia, US Geological Survey, MS 917, Reston, Virginia, 22092.

USSR

The annual meeting of the Scientific Council for Earth Cryology of the USSR Academy of Sciences was held in March 1989 in Moscow. About 90 papers and posters were discussed at seven sessions. The Plenary papers were: Geochemical processes and mineral resources in the recent and ancient zones of gas hydrates; The development of the oil-gas industry on the North and the aims of the geocryological ecological researchers; The problem of icings; The problems of geocryological researches in Yamal peninsula; A theory of the soil cryogenesis; Northern hydrology; Numerical modelling of the interaction between cryolithozone and gas-hydrate deposit; The Cryosphere as a component of the water exchange system; The geocryological researches in the Arctic.

The same meeting of the Scientific Council was held in March 1990 in Moscow. 70 papers and posters were discussed at 8 sessions. The Plenary papers were: Climate change and permafrost; Temperature profiles and thickness of permafrost influenced by local conditions; Changes of recent permafrost caused by climate fluctuations; Quaternary glaciation in the permafrost area in middle Asia mountains; A genesis and age of the underground ice of the Novosibirskie islands; Engineering-ecological measures by oil-gas industry constructions. The conference "*Geoecology, problems and decisions*" was held in April 1990 in Moscow (Department of Geology of the USSR). At the session "The ecological problems in the Cryolithozone", 5 papers were discussed: The sensibility of northern ecosystems to a technogenic impact in permafrost area; Ecology and a development of the Cryolitozone; Problems of the landuse by a development of the Yamal Peninsula; geoecological research on permafrost field stations; geocryological research by mining in permafrost area.

Books, prepared by the Scientific Council for Earth Cryology, edited by "Nauka", Moscow in 1989 were:

1. Goncharov, Yu.M. "*Foundations on Permafrost*" (Effectivni construkcii fundamentov na vechnomerzlich gruntah).
2. Romanovski, N.N., Tjurin, A.L., Sergeeve, D.O. "*Rock streams of bald-mountain belts*" (Kurumi golgsovogo pojasa)

Books, edited by "Nedra", Moscow (1989) include the Monographs "*Geocryology of the USSR*" which are detailed in the *Miscellaneous Items* section.

Several meetings concerning geocryologic issues were held during 1989. The All-Union Conference on geocryological base of soil cryogenesis was held in February near Moscow. The 3rd All-Union conference on icings met in Irkutsk in March. An international symposium on problems of boring in difficult conditions met in Leningrad in June. In Jamburg (West Siberia) an International Symposium on the Geocryology of

the Arctic was held (see *Frozen Ground* No.6). In November there was a meeting on the ecology of cities in Siberia.

A further seminar is planned for September 1990 in Leningrad under the title: *Engineering - Geological Study and Estimation of Conditions of Permafrost, Seasonal Frost and Thawing Fine-grained Soils.* The meeting is organized by the USSR Ministry of Energy Industry. Discussion will cover methods, general results, and soil behaviour at the base of buildings, dykes and pits. Potential overseas participants should submit a short (5-6 pages) report for publication. For further details, contact 195220, Leningrad, Gzhatskay. Tel: Leningrad 555-88-90 (Kzivonogova): Moscow 280-13-86 (Nikitina).

MISCELLANEOUS

International Geological Correlation Program Project No. 297 "*Geocryology of the Americas*"

Description of the Project:
The aims of the project are clearly defined as: (i) to identify present and past geocryogenic processes, (ii) to correlate them across the Americas and elsewhere, (iii) to identify areas of future application and nature conservation, and (iv) to stimulate training in geocryology.

Five meetings are planned:
In South America, North America, South Africa, China and Central Europe. Immediate results will deal with: (i) freezing processes and geochemistry, (ii) differentiation of freezing processes in cold deserts from evaporation processes in warm deserts, and (iii) past geocryogenic changes and global climate changes. The project foresees applied aspects of geocryology in mineral prospecting and problems of permafrost in cold environment.

Resumé of activities:
The organizational meeting of the International Union of Geological Sciences (IUGS), International Geological Correlation Program (IGCP) Project No. 297, "Geocryology of the Americas", took place in Mendoza, Argentina, October 16 - 20, 1989. 24 geologically oriented scientists, representing 8 countries, spent 3 days presenting papers on periglacial (geocryological) features and processes and discussing the direction that future work should take. Of the 36 papers and abstracts submitted to the group for this meeting, 19, which illustrated well the wide interests of the participating group, were presented orally, as were 3 poster sessions. The papers fell into three categories: 1) chronologies, correlations and climatic changes; 2) present and past processes; 3) laboratory experiments and applications.

Future activities:
Because intercontinental correlation of permafrost through time including Europe, Asia and Africa, as well as the Americas, is among the goals of this project, a meeting has been planned for each of these continents during the coming 5 years. The 1990 meeting will be in South Africa, held in association with the South African Quaternary Association (SASQUA); in 1991, the meeting will be in western Europe; in 1992 in North America, probably at Calgary with field trips in the Canadian Rocky Mountains (Alberta) and in the Wyoming-Colorado area; in 1993 the meeting is scheduled for China in association with the 6th meeting of the International Permafrost Association (IPA); and a final meeting will take place in Argentina again in 1994, probably in Patagonia, as a comprehensive review for stratigraphy and correlation. A questionnaire and interviews indicated the desire to publish all discussed papers as a single volume of *Acta Geocriogenica* No.5.

Arturo E. Corte
Centro Regional de Investigaciones
Cientifica y Tecnologicas
CRICYT, CONICET
C. Correo 330 - 5500 Mendoza, Argentina.

William Wayne
University of Nebraska
Lincoln
Nebraska
USA.

CALENDAR OF RECENT AND FORTHCOMING MEETINGS

1990

The 8th International Research Basins Symposium and Workshop
26-30 March, 1990, Abisko, Sweden
Contact: Christina Nilsson, Secretary Organising Committee, 8th NRB s/w, Division of Water Resources Engineering, Luleå University of Technology, S-951 87, Luleå, Sweden. Phone: 920-91468, Telex: 80447 LUHS, Fax: 920-91697

Climate of the Northern Latitudes: Past, Present and Future
2-4 April, 1990
Contact: Morton Hald, University of Tromso, Geological Department IBG, PO Box 3085, N-9001 Tromso, Norway.

XV General Assembly, European Geophysical Society
24 April 1990, Copenhagen, Denmark
Contact: R.J. Braithwaite, The Geological Survey of Greenland, Oster Voldgade 10, DK-1350 Kobenhavn K, Denmark.

Royal Meteorological Society: "The history of polar meteorology and oceanography"
12 May 1990, Cambridge, UK
Contact: J.M. Walker, Department of Maritime Studies, University of Wales, PO Box 907, Cardiff CF1 3YP, UK.

Late Vistulian and Holocene Aeolian Phenomena in Central and Northern Europe Poznan, Poland
14-18 May 1990, Poland
Contact: Dr. Stefan Kozarski, Adam Mickiewicz University, Quaternary Research Institute, Fredry 10, PL-61 701 Poznan, Poland.

CANQUA/AMQUA - Rapid Change in the Quaternary Record
4-6 June 1990, Waterloo, Ontario, Canada
Contact: Alan V. Morgan, WATERLOO 1990, Department of Earth Sciences, University of Waterloo, Waterloo, Ontario, Canada, N2L 3G1. Phone: (519) 885-1211 (ext. 3231), Fax: (519) 746-2543 or (519) 888-4521.

Fifth Canadian Permafrost Conference
6-8 June 1990, Quebec City, Quebec, Canada
Contact: Mike Boroczki, Fifth Canadian Permafrost Conference, National Research Council of Canada, Ottawa, Ontario, Canada K1A 0R6. Phone: (613) 993-9009, Telex: 053-3145, Fax: (613) 952-7928.

47th Eastern Snow Conference
7-8 June 1990, Bangor, Maine, USA
Contact: Nabil Elhadi, Water Resource Planning Branch, N.B. Environment, PO Box 6000, Fredericto, N.B., Canada E3B 5H1).

13th Polar Libraries Colloquy
10-14 June 1990, Rovaniemi, Finland
Contact: Liisa Kurppa, Arctic Center, University of Lapland, PO Box 122, 96101 Rovaniemi, Finland. Phone: 60-324-275, Telex: 19205519, Fax: 60-324-270.

International Conference on the Role of the Polar Regions in Global Change
11-15 June 1990, Fairbanks, Alaska
Contact: Gunter Weller, Geophysical Institute, University of Alaska, Fairbanks, AK 99775, USA. Phone: (907) 474-7371, Telex: 35414, Fax: (907) 474-7290.

Northern Hydrology Symposium
10-12 July 1990, Saskatoon, Canada
Contact: C.S.L. Ommanney, Scientific Information Division, National Hydrology Research Institute, 11 Innovation Boulevard, Saskatoon, Saskatchewan, Canada S7N 3H5.

Quaternary Stratigraphy and Events in Eurasia and Pacific Region
13-21 July 1990, Yakutsk, USSR
Contact: A.E. Dodonov, Geological Institute, USSR Academy of Sciences, Pyshevsky per. 7, Moscow 109017, USSR.

16th Scandinavian Hydrologic Conference
29 July - 1 August 1990, Kalmar, Sweden
Contact: Mr. Jorgen Nilsson, SMHI, chairman. Tel: 46-11-158345.

1990 National Conference on Hydraulic Engineering (Cold Regions Hydrology and Hydraulics sessions)
30 July - 3 August 1990, San Diego, California
Contact: Howard H. Chang, Department of Civil Engineering, San Diego State University, Sand Diego, California, 92182, USA. Phone: (619) 594-6380.

5th International Symposium on the Interactions Between Sediments and Water
6-9 August 1990, Uppsala, Sweden
Contact: Uppala Water Centre, Institute of Limnology, University of Uppsala, PO Box 557, S-75122 Uppsala, Sweden.

Polar Tech '90
14-16 August 1990, Copenhagen, Denmark
Contact: Conference Secretariat, Danish Hydraulic Institute, Agern Alle 5, DK-2970 Horsholm, Denmark. Phone: 42-86-80-33, Telex: 37402 DHICPH DK, Fax: 42-86-79-51

10th IAHR Symposium on Ice
20-23 August 1990, Helsinki, Finland
Contact: Mauri Maattanen, Helsinki University of Technology, Otakaari 1, Sf02150, Espoo, Finland.

Engineering-Geological Study and estimation of conditions of permafrost, seasonal frost and thawing fine-grained soils
September 1990, Leningrad, USSR
See USSR National Adhering Body report for details.

Geocryology of Southern Africa
5-17 September 1990
Contact: Colin Lewis, Department of Geography, Rhodes University, PO Box 94, Grahamstown 6140, South Africa.

Third Northern Regions Conference: Cooperation in a Changing World
16-20 September 1990, Anchorage, Alaska
Contact: Ginna Brelsford, Project Manager, Governor's Office of International Trade, 3601 "C" Street, Suite 798, Anchorage, Alaska 99503, USA. Phone: 907-561-5585, Fax: 907-561-4577, Telex: 200-25-278.

Second International Conference on Ice Technology
18-20 September 1990, Cambridge, UK
Contact: C.A. Brebbia, Computational Mechanics Institute, Ashurst Lodge, Ashurst, Southampton, SO4 2AA, United Kingdom. Phone: 042129-3223, Telex: 47388 ATTN COMPMECH, Fax: 042129-2853.

ICSI International Symposium on the Interaction of Glaciers with the Ocean and Atmosphere
23-28 September 1990, Leningrad, USSR
Contact: V.M. Kotlyakov, Institute of Geography, Academy of Sciences USSR, Startomonetny 29, Moscow 109017, USSR.

1991

Sixth International Conference on Cold Regions: Cold Regions Engineering Technology for the 21st Century
26-28 February 1991
Contact: Devinder Sodhi, CRREL, 72 Lymne Road, Hanover, NH, 03755-1290, USA. Phone: (603) 646-4100.

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

XIII INQUA Congress
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

Symposium on Water and Ice as Geophysical Agent 1991 IUGS General Assembly
11-27 August 1991, Vienna, Austria
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.

6th International Symposium on Ground Freezing
September 1991, Beijing, China
Contact: Hans Jossberger, Ruhr-University Bochum, PO Box 102148, D4630 Bochum 1, Federal Republic of Germany. Phone: 02-341700-6135, Telex: 0 825 860 UNIBO D.

1992

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.

IGU Pre-conference field trip
1-7 August 1992, Indian Peaks, Colorado
Contact: Colin Thorn, Dept. of Geography, University of Illinois, 607 South Mathews 220, Urbana, IL 61808, USA.

IGU Congress, 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.

6th International Conference on Permafrost
5-9 July 1993, Beijing, China
Contact: Cheng Guodong, Lanzhou Institute of Glaciology and Geogryology, Academia Sinica, Lanzhou, China.
Phone. 26726-385, Telex: 72008 IGGAS CN.
(See Report from IPA Council for details)

International Permafrost Association

NATIONAL CONTACT ADDRESSES

Argentina
Head, International Relations
Rivadavia 1917-1033
Buenos Aires
Republic of Argentina.

Belgium
Dr. P. Haesaerts
IRSNB
Rue Vautier 31
B-1040
Bruxelles, Belgium.

Canada
Mr. J.A. Heginbottom
Geological Survey of Canada
601 Booth Street
Ottawa, Ontario
K1A 0E8, Canada.

China
Professor Shi Yafeng
Honorary Director
Lanzhou Institute of Glaciology and Cryopedology, Academia Sinica
Lanzhou, China.

Denmark
Thorkild Thomsen
Danish Society for Arctic Technology
Rosenvængets Allé 16
Copenhagen Ø
Denmark.

Federal Republic of Germany
Dr. Ing H.L. Jesseberger
Civil Engineering, Ruhr-University Bochum
PO Box 102148
4630 Bochum 1, FRG.

Finland
Dr. Martti Eerola
Tie-ja vesirakennushallitus
PL 33
SF-00521 Helsinki, Finland.

France
J. Aguirre-Puente
Laboratoire d'Aerothermique
CNRS, Route des Gardes
F-92190 Meulan, France.

Italy
F. Dramis
Department of Geology
Universita di Camerino
Italy.

Japan
M. Fukuda
Institute of Low Temperature Science
Hokkaido University
Sapporo 060, Japan.

The Netherlands
Mrs. M.K. van Helden
Secretariat INQUA Commissie Netherland
c/o Koninklijke Nederlandse Ahademie van Wetenschappen, PO Box 19121, 100 GC
Amsterdam, The Netherlands.

Norway
O. Gregersen
Norwegian Geotechnical Institute
PO Box 40
Tisen
0801 Oslo 8, Norway.

Poland
A. Jahn
Committee on Polar Research
Polish Academy of Sciences
00-901 Warsaw PKIN
Poland.

Switzerland
W. Haeberli
Versuchsanstalt für Wasserbau, Hydrologie und Glaziologie
ETH-Zentrum
CH-8092, Zurich, Switzerland.

Sweden
Professor Anders Rapp
Department of Geography, University of Lund
Soelvegatan 13
S-233 62, Lund, Sweden.

United Kingdom
Dr. C. Harris
Department of Geology
University of Wales, PO Box 914
Cardiff, CF1 3YE, UK.

USA
J. Brown
Division of Polar Programs
National Science Foundation
Washington, DC 20550, USA.

USSR
Academician P.I. Melnikov
Scientific Council on Earth Cryology
USSR Academy of Sciences
Fersman Sreet 11, 117312 Moscow, B-312, USSR.