



Frozen Ground

Number 11

The News Bulletin of the International Permafrost Association

June 1992



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 18 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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Belgium	Germany	Russia
Canada	Italy	Sweden
China, People's Republic	Japan	Switzerland
Denmark	Netherlands	United Kingdom
Finland	Norway	USA

Cover Photograph:

Vertical air photograph of the main channel of the Colville River delta, Northern Alaska, showing collapse of large blocks of frozen ground as a result of undercutting by water (thermoerosional niche). Insert illustrates ice wedges exposed as blocks collapse. Photographs by H. J. Walker, Louisiana State University.

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International Permafrost Association

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Frozen Ground, the News Bulletin of the International Permafrost Association (IPA), is published semi-annually. The IPA is a non-governmental association of national organizations representing 18 countries. The success of the bulletin is entirely dependent upon the willingness of IPA participants to supply information for publication. Copy date for issue No. 12 is the end of October 1992. Please ensure that working group and member country reports are submitted in good time for publication. News items for inclusion in the *Miscellaneous* section are also very welcome from any IPA participant, as are interesting photographs for the cover (please furnish 8"×10" black and white glossy prints). For copies of *Frozen Ground* and submission of news items or photos please contact the appropriate individual listed on page 23 or Chairman, IPA Editorial Committee, P.O. Box 9200, Arlington, Virginia 22219-0200, USA.

Issue No.11 of *Frozen Ground* was compiled by Jerry Brown. Production is courtesy of the Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, USA.

PRESIDENT'S COLUMN

This issue of *Frozen Ground* will reach many of you after the IPA Council meeting in Washington, D.C., in early August. We are meeting in Washington in order to economize on travel plans for those attending the 27th International Geographical Congress. Our main agenda items concern preparation for the Sixth International Conference on Permafrost to be held in Beijing next July and the concurrent Council and Working Group meetings. Since much of what IPA does involves in-interests of other scientific and engineering organizations and individuals, I would like to use this column to review some of the on-going activities and connections IPA has with others.

IPA is an Affiliated Organization of the International Union of Geological Sciences. The IUGS is one of the largest and most active nongovernmental scientific organizations in the world. Its President is Umberto Cordani of Brazil and there are eight vice presidents. There are adhering members from 100 countries. Founded in 1961, it promotes and encourages the study of geological problems, especially those of worldwide significance. It sponsors the quadrennial International Geological Congress, the International Geological Correlation Programme (with Unesco) and the International Lithosphere Program (with IUGG and ICSU). The journal *Episodes* is published quarterly by IUGS. The IUGS consists of Commissions, Affiliated Organizations and Joint Programs, and these are listed with their representatives in the center pages (p. 12 and 13) of this issue. I encourage IPA activities to establish contact with appropriate IUGS organizations and to advise us of these cooperative activities. Some of you are already working with IGCP Project 297 on the Geocryology of the Americas and Project 253 on the Termination of the Pleistocene. Many of us have been associated with INQUA over the years and we are discussing collaboration with its newly formed INQUA Commission on Global Continental Paleohydrology.

The IPA Secretary General provides an annual report to the IUGS. In 1991 the status of the multi-lingual glossary, the permafrost map and the bibliography on present global change and permafrost were presented and the report was accepted by the IUGS Executive Committee with compliments.

The IPA maintains contact with the ICSU International Commission on Snow and Ice through its Division of Ice as a Material. Our Working Groups (see p. 3) share activities with the IGU Commission on Frost Action, the International Symposium on Ground Freezing, the IGY Data Centers, the Intergovernmental Panel on Climate Change, the Unesco Man and the Biosphere Programme, the International Arctic Science Committee, the International Society of Soil Mechanics and Foundation Engineering, the International Road Federation, and the Polar Libraries Colloquy, to name some of the many international organizations, and with national organizations and societies too numerous to list here, but reported on elsewhere in this news bulletin.

Over the next few years or so there will be more and more national and international conferences, meetings, field excursions, etc. of interest to frozen ground specialists (see calendar, p. 20). These events are nearly "back to back" or consecutive, and none of us can possibly keep track of or attend even a small number. In my capacity as President of IPA, I ask those of you involved in scheduling IPA meetings to consult with each other ahead of time. This is particularly necessary for IPA Working Groups in order to avoid direct conflicts with other important meetings. IPA is willing to help serve as a clearinghouse for the scheduling of meetings related to frozen ground and for disseminating information before and after meetings. Your cooperation and comments are both welcomed and necessary.

Troy L. Péwé, President, IPA

IPA STANDING COMMITTEES AND WORKING GROUPS

MEMBERSHIP AND PURPOSE OF WORKING GROUPS AND STANDING COMMITTEES

The following Standing Committees and Working Groups have been approved by the IPA Council. Working groups are expected to report progress at Council meetings and regularly in the *Frozen Ground* News Bulletin.

Standing Committees

Advisory Committee on Working Groups

C.W. Lovell, Chairman	USA
M. Seppälä	Finland
V.P. Melnikov	Russia

Finance Committee

H.M. French, Chairman	Canada
O.J. Ferriars, Jr.	USA
A. Pissart	Belgium
Shi Yafeng	China
J. Ross Mackay, Ex Officio	IPA Executive

Editorial Committee

Jerry Brown, Chairman	USA
Cheng Guodong	China
H.M. French	Canada
N.A. Grave	Russia
L. King	Germany
E.A. Koster	The Netherlands
T.L. Péwé, Ex Officio	IPA Executive

Working Groups

Present Global Change and Permafrost

Purpose: To identify the effects 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
W. Andres	Germany
A.E. Corte	Argentina
M.K. Gavrilova	Russia
D.W. Hayley	Canada
W.C. Oechel	USA
T.E. Osterkamp	USA
A. Rapp	Sweden
Cheng Guodong, Ex Officio	IPA Executive

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	Italy
A. Gorbunov	Russia
Cheng Guodong	China
J. Giardino	USA
S.A. Harris	Canada

Terminology

Purpose: To develop a set of internationally accepted permafrost terms for engineering and scientific use, with language equivalents. The Working Group would strive to disseminate and encourage use of such terminology.

R.O. van Everdingen, Chairman	Canada
R.G. Barry	USA
A.E. Corte	Argentina
O.J. Ferriars, Jr.	USA
Qui Guoqing	China
J. Karte	Germany
B. Ladanyi	Canada
N.N. Romanovskiy	Russia
M. Seppälä	Finland

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	United Kingdom
R.G. Barry	USA
N.A. Grave	Russia
J.A. Heginbottom	Canada
Bangjun Wu	China

Foundations (membership list incomplete)

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	Russia
K. Flaate, Secretary	Norway
R. Tart	USA

Seasonal Freezing and Thawing of Permafrost Areas

Purpose: To improve the exchange of information on, describe the state of knowledge about, and stimulate research activities concerning frost action in soils and measures to protect against its harmful effects in permafrost areas. The Working Group would interact with other national and international groups (e.g. ISSMFE, International Symposium for Ground Freezing, International Road Federation, etc.)

A. Phukan, Chairman	USA
B. Ladanyi, Secretary	Canada
M. Fukada	Japan
H.L. Jessberger	Germany
S. Knutsson	Sweden
L. Kong	United Kingdom
K. Senneset	Norway
E. Slunga	Finland
V.S. Petrov	Russia

Periglacial Environments (IPA)

Purpose: To promote geomorphological research related to permafrost.

J-P. Lautridou, President	France
C. Harris, Secretary	United Kingdom
H.M. French	Canada
B. Hallet	USA

S. Kozarski	Poland
A. Pissart	Belgium
M. Seppälä	Finland
J. Vandenberg	The Netherlands
R.O. Everdingen, Ex Officio	IPA Terminology

Commission on Frost Action Environments (IGU)

Purpose: The Commission on Frost Action Environments was established at the IGU Congress in Sydney, Australia, in August 1988. The new Commission will continue the work of the former Commission on the Significance of Periglacial Phenomena, promoting research into periglacial environments, processes, land-forms, and sediments. The IGU Commission and the IPA Working Group on Periglacial Environments will operate jointly in promoting meetings, field excursions, discussion sessions, and 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 land-forms and sediments which result. A periodic newsletter is prepared and sent to all corresponding members.

J-P. Lautridou, President	France
C. Harris, Secretary	United Kingdom
M. Allard	Canada
K. Hall	South Africa
Y. Ono	Japan
C. Thorn	USA
A. Velichko	Russia
E.A. Koster, Ex Officio	IPA Global Change
H.M. French, Ex Officio	IGU Commission on Frost Action

REPORTS

Complete reports for standing committees and working groups will be presented at the August 7-8, 1992, IPA Council meeting in Washington, DC. The following summaries are intended to serve as brief progress reports on several major IPA activities. More detailed reports will be presented in *Frozen Ground* No. 12.

Editorial Committee

The main activities focused on processing of abstracts and papers for the Sixth International Conference on Permafrost and preparation of the circumarctic permafrost map. Approximately 400 abstracts from 20 countries were received. Of these, approximately 160 papers were invited to be submitted to the Editorial Committee for international review. In order to meet

the review deadlines of fall 1992, the remainder of the Chinese, Mongolian and Russian papers are being processed in China and Russia, using review procedures similar to those for the other manuscripts. As of press time (mid-June), 70 papers had been received by the Editorial Committee and at least two reviews requested for each paper. The Editorial Committee plans to meet in conjunction with the IPA Council meetings in August to complete the necessary steps in the review process. Authors of accepted papers will receive instructions for revisions of manuscripts and preparation of the final camera copy by late September 1992.

Substantial progress has been made on the circumarctic permafrost map. Members of the mapping group

met at the Geological Survey of Canada in Ottawa during the week of April 20. These included Alan Heginbottom (Canada), Evgeny Melnikov (Russia), and Oscar Ferrians and Jerry Brown (USA). The meeting time was arranged to coincide with the completion of the joint Canada–Russia permafrost field program in Canada. The legend as presented in *Frozen Ground* No. 10 was revised and representative segments of national maps and principles for mapping were reviewed. Using the revised legend, draft compilations of Alaska, Canada and West Siberia are now compiled. The Canadian segment will utilize the new permafrost map being prepared for the National Atlas of Canada, which also employs a legend similar to the IPA map. A new layout for the base map has been prepared at the U.S. Geological Survey. The compilation as it then exists will be available for review at the August IPA Council meeting. Details on mapping alpine or mountain and plateau permafrost will be discussed with members of the Editorial Committee and Council. Several short review papers related to the mapping project have been prepared and were presented as posters at several recent Arctic and Polar meetings. The draft manuscript describing the map is in preparation. We still anticipate that the completed map will be available in Beijing in July 1993. A small review meeting will be needed in fall 1992 and perhaps another in spring 1993 to complete the map

Report by Jerry Brown, Chairman

Terminology

Progress since the report in *Frozen Ground* No. 10 includes:

- German translations of primary and secondary terms in the Glossary were received from J. Karte

and have been incorporated in the multi-lingual Glossary index.

- Corrections and amendments for the Russian translations of the Glossary terms have been received from N.N. Romanovskiy and incorporated in the index. Transliterations of the Russian terms (from Cyrillic to Latin alphabet) have been prepared, using the Library of Congress system.
- A Russian permafrost glossary, containing more than 1000 terms, was compiled by Romanovskiy and co-workers. Definitions and comments still have to be translated and prepared. Some financial support is being provided by IPA for this work.
- A paper including sample pages from the index was prepared for submission to the Sixth International Conference on Permafrost. The possibility of publication of the complete index in *Permafrost and Periglacial Processes* is being explored. Improvement is still needed in the way the database handles synonyms, etc. It is expected that printouts of the current draft can be made available after August 1992, at a cost of \$6.00 (US) per language section, or \$25.00 (US) for the five-language set.

Prepared by Robert O. van Everdingen
Chairman

The IPA Mapping and Terminology projects are essentially volunteer efforts with no firm financial support. Several requests for modest funding have not been successful. If the readers of this bulletin are aware of possible financial sponsors, please contact the Chairmen. Progress can be greatly increased with additional support.

NEWS FROM MEMBER COUNTRIES

ARGENTINA

The International Geological Correlation Programme Project No. 297, "Geocryology of the Americas," will have its fourth meeting together with the Sixth International Conference on Permafrost in Beijing. It will be joined by the IPA Working Group on Periglacial Environments. Those interested in presenting papers for these meetings should send them to Cui Zhijiu, Department of Geography, Peking University, Beijing, China, before April 30, 1993. Plans are to present these papers to the journal *Permafrost and Periglacial Processes* for publication. More information on the IGCP meeting can be obtained from Arturo Corte or Jean-Pierre Lauridou.

Over the past year or more, a number of international scientists have visited field sites and laboratories in Argentina, including:

A. Gorbunov from Alma Ata, who visited several rock glacier sites.

Tatjana Kademtsova from Moscow, who is studying the the relationship of snow depth to permafrost distribution in the Andes.

Xie Zichu from Lanzhou, who discussed student exchanges, and *Wei Yaoshi*, a student, who is now conducting field field studies on pre-Cordilleran glaciation and geocryology.

Thea Vogt from Strasbourg, who conducted field research on calcium carbonate precipitation under cryogenic conditions.

Lothar Schrott, a student from Heidelberg University, spent two years in the IANIGLA conducting field studies on the relationship of incoming radiation and rock glaciers.

Report by Arturo E. Corte

CANADA

Permafrost research in Canada is undertaken within various agencies and organizations. Most work is carried out, however, in universities, consulting engineering companies and government laboratories (see *Frozen Ground* No. 10 for a review of permafrost research at the Geological Survey of Canada). This report comprises a short note about research on pipelines in permafrost being undertaken at Carleton University, Ottawa, and a review of permafrost engineering work done at one of Canada's major consulting engineering companies, EBA Engineering Consultants Ltd., of Edmonton.

Chilled Pipelines and Frozen Soils:

The Geotechnical Science Laboratories of Carleton University, Ottawa, cooperate with the French institutions, Laboratoire Central des Ponts et Chaussées and Centre National de la Recherche Scientifique, in operating a large controlled-environment laboratory in Caen, France. The experiments study the effects of natural gas pipelines in northern terrain. The passage of a buried chilled gas pipeline across the boundary between permafrost and unfrozen, frost-susceptible ground is simulated. Frost heave of the ground surface, stresses in the ground and soil displacement are

being monitored. Data from the first phase of the experiment are presently being analyzed. High stresses develop within the frozen soil and the deformation of the pipe is characterized by a sharp inflection at the interface between the permafrost body and the adjacent soil. Sophisticated instrumentation has given much information on the thermodynamics of freezing soil. For further information contact Peter Williams or Michael Smith, Geotechnical Science Laboratory, Carleton University, Ottawa.

Consulting Engineers' Contribution to Permafrost R&D:

Consulting engineers have made substantial contributions to the advancement of permafrost engineering and science in North America over the past 20 years. The research is "demand-driven," with projects usually requiring unique engineering solutions within a set time frame and a fixed budget. Consultants also fund their own internal research in expectation that the product will provide a competitive edge. Internal R&D is often directed at sampling and testing tools or computer programs for improved analyses or possible sale.

Exploration for oil and gas in the western Canadian Arctic, in the early 1970s, provided unique opportunities for consultants to carry out industry-funded research. An immediate need was created to develop a methodology for permafrost terrain analysis, improve predictive capabilities for design and for innovative construction techniques. The following briefly describes applied research carried out at EBA Engineering Consultants Ltd. and how it has helped to close the technology gap between fundamental research and design and construction practice.

One of the most significant contributions of the consulting industry has been the development of a number of computer programs to perform ground thermal analyses. EBA developed a finite element program that models transient heat conduction in the ground for the purpose of predicting thaw or freezing. The program can accommodate phase change over a range of temperatures which can be used to model the variation of unfrozen water content with temperature. The boundary conditions can be applied through a number of options such as meteorological data applied at the ground surface, constant heat transfer at an interface or constant temperature applied at a boundary. The program can also simulate a change of the freezing domain geometry due to thaw subsidence. It is commonly used to simulate the thermal behavior of buried pipelines, utilidor systems, heat pipe foundations, and frozen backfill for mines in permafrost. Many years of experience has established geothermal predictions as a design tool for most northern projects. It is also being used by terrain scientists to model geomorphic processes.

One of the construction methods for artificial islands used for drilling platforms in the Alaskan Beaufort Sea has been the use of frozen granular material excavated from pits and quarries. EBA carried out a testing program to evaluate the engineering properties of frozen granular fill dumped through seawater at its freezing point. A number of special tests were designed to evaluate the material properties including: compacted and non-compacted densities of frozen and thawed soils; thaw strain and consolidation behavior; thermal conductivity; angle of repose; sedimentation characteristics; shear strengths for frozen and thawed soils; and the in-place density of the mass of frozen lumps placed under water at sub-zero temperatures. A number of conclusions were drawn from the laboratory results. The two most significant are: 1) the lump sizes and gradation influence the density of the fill, and 2) the strength of a subsea structure formed from frozen lumps can exceed the strength of a similar structure built from thawed fill material.

A number of studies of subsidence caused by production of hydrocarbons through permafrost have been undertaken at EBA. The theoretical analysis considered three different aspects. First—the transient thermal changes due to the temperature boundary condition on the well casing; second—prediction of the deformation of the soil due to thaw; and third—the development of stresses and strains on the well casing.

A special testing program was carried out by EBA on samples from a deep core drilled to provide data throughout the subsea permafrost horizon. The testing program was developed to assess thaw strains and consolidation properties under high stress conditions in a temperature-controlled odometer. The specially designed apparatus could measure stresses, changes in pore pressure and volumetric strains both in the vertical and radial directions upon thaw.

Another phase of the testing program established a correlation between geophysical and physical properties of the deep subsea permafrost. This component was carried out as contract research for the Geological Survey of Canada. The program was developed to measure seismic S and P wave velocities on undisturbed samples at in-situ stresses and temperatures and to correlate the laboratory results with downhole measurements.

EBA recently carried out a comparative study of two different frost heave testing procedures to select the best method for production testing for a proposed natural gas pipeline across Alaska. The two methods selected were the quick freezing insulated warm end test and the ramped temperature test. A number of improvements were made to standard equipment to achieve the desired precision during testing. The test was carried out in a water-cooled environmental enclosure instead of in a cold room. An in-line feedback temperature control system coupled with moderators and multiple heaters were provided to produce temperature stability of $\pm 0.1^\circ\text{C}$ at both end plates. The test cell was designed as a solid barrel inserted into an insulated jacket and a temperature gradient control was developed to promote one-dimensional frost front advancement during testing. The test method was developed and overview provided by a committee of experts assembled by the client.

A recent research program at EBA was a study of the mechanical behavior of saline permafrost. This study was carried out under contract for the Geological Survey of Canada with the objective of further developing the understanding of strength and time-dependent de-

formation properties of frozen saline soils. The study investigated the influence of soil type, salinity concentration, confining stress and strain rates on the mechanical behavior of three different frozen soils.

Research carried out within the consulting industry allows firms to develop expertise that makes them more competitive, improving opportunities for international marketing of services. It complements and builds on the more fundamental research carried out at

universities. Firms currently operating in the Canadian and Alaskan arctic regions have developed unique skills for dealing with design and construction on permafrost terrain. The skills related to planning and executing field programs, project management, analyses and design methods will be needed for development of other circumpolar regions.

Prepared by Elizabeth Hivon and Don Hayley
EBA Engineering Consultants, Ltd., Edmonton

CHINA

The new Director of the Lanzhou Institute of Glaciology and Geocryology (LIGG) is Cheng Guodong.

The Fourth Council (1992–1995) of the Chinese Society of Glaciology and Geocryology (CSGG) has been established. The new officers of the CSGG are:

Honorary President—Shi Yafeng (*LIGG*); President—Cheng Guodong (*LIGG*); Vice Presidents—Cui Zhijiu (*Beijing University*), Huang Maohuan (*LIGG*), Xio Yinqi (*Heilongjiang Provincial Research Institute of*

Water Conservancy), Ding Jingkang (*Northwest Institute of Chinese Railway Academy of Sciences*).

The new Editorial Board of the Journal of Glaciology and Geocryology has been approved by the CSGG Council:

Consulting Editor—Shi Yafeng (*LIGG*); Editor in Chief—Huang Maohuan (*LIGG*); Deputy Chief Editors—He Xing (Standing) (*LIGG*) and Xu Xiaozu (*LIGG*).

GERMANY

After reunification of Germany and the beginning of the reorganization of the governmental and university institutes of the former German Democratic Republic, scientific cooperation has started and efforts are being made for joint projects at many places. Special mention is made of the establishment of a multi-disciplinary polar branch “Kontinentale Polarforschung” at Potsdam by the Alfred Wegener Institute for Polar Research. The aim is to offer good research opportunities for polar scientists of the former GDR at a central place within East Germany. The research institution includes 40 full-time positions. The library of the former polar research in the GDR has been integrated in this institution and will be supplemented with literature from the western countries. The following topics will be mainly researched in Potsdam:

1. Atmospheric circulation in polar areas (atmospheric aerosols)
2. Periglacial research
 - a) Quantitative analysis of cryogenic weathering and denudation processes (with physical and geochemical methods)
 - b) Permafrost, periglacial processes and “global change”

3. Reconstruction of the Holocene glaciation history from sea sediments
4. Continental ice sheets as archives for “global change”

The National German Permafrost Committee is trying to contribute to these national efforts and distributes regularly a “Permafrost Circular” to permafrost scientists in Germany together with the IPA News Bulletin *Frozen Ground*.

The international and interdisciplinary “SPE” expedition to Liefdefjorden, northern Spitsbergen, will again take place in summer 1992. A group of 11 geographers from the universities of Basel, Giessen and Heidelberg will study processes mainly related to snow melt between May 15 and July 10. The main group, from 12 universities, will consist of 28 geoscientists and biologists with an additional marine-oriented group. Permafrost-related studies include periglacial geomorphology (ground ice and thermal erosion), glacial geomorphology (e.g. types of moraines in a permafrost environment), fluvial sediment transport and general permafrost ecology. Most of the groups listed in *Frozen Ground* No. 8 (p. 9–10) will again participate in this last Spitsbergen expedition. The base camp

at Liefdefjorden, erected in the fall of 1989, will be closed at the end of August 1992 and removed. Results of the expedition 1990–91 were presented during a DFG-sponsored symposium in Stuttgart and will be published later this year in a text volume (in Stuttgart) and in a data volume (in Basel), respectively.

Engineering activities in Germany are related to artificial ground freezing for application in shaft sinking. Further permafrost-related, applied scientific activities are focused on the distribution of alpine permafrost in the Swiss Alps (Zermatt) and German Alps (Zugspitze).

Prepared by Lorenz King
Justus Liebig-Universität

JAPAN

Beginning in summer 1992, Japan and Russia will undertake joint permafrost studies. The program described below had its start in spring 1990 when the cities of Sapporo and Novosibirsk established sister city relations. Both cities agreed to support scientific exchange programs among institutes located in each city. The Siberian Branch of the Academy of Sciences in Novosibirsk asked the Permafrost Institute in Yakutsk to develop a joint scientific exchange program with the Institute of Low Temperature Science (ILTS) in Sapporo. Dr. Kamensky, Director, Permafrost Institute, and Professor Fukuda exchanged proposals. In November 1990, Professors Fukuda and Yoshida visited both the Permafrost Institute and Biological Institute in Yakutsk. Agreement was reached to start preparations for a joint exchange program related to physical and biological aspects of permafrost. In May 1991, Dr. Kamensky and Dr. Balobaev visited Sapporo to complete the proposals for the exchange. During the Sapporo meetings, scientists from the Center for Global Environmental Research of the National Institute of Environmental Research in Tsukuba discussed joint studies on the monitoring of methane emissions from permafrost areas. The following resulted from these discussions and will take place in summer 1992.

1) **Permafrost Group:** Institute of Low Temperature Science (ILTS) and the Permafrost Institute.

Main objective: Permafrost occurrence and genesis related to climatic changes; permafrost changes influenced by recent global warming trends of climate.
Main areas of survey: Lena River delta near Tiksi and Yenisey River area near Igaruga.

2) **Biology Group:** ILTS and Biological Institute.

Main objective: Biogeography, populations and community ecology of plants and insects in Siberian permafrost region.

Main areas of survey: Upper, middle and lower reaches of Lena River.

3) **Forest Research Group:** Forest Research Institute (FRI, Sapporo) and Biological Institute.

Main objective: Carbon storage and carbon dioxide budget in permafrost regions of Siberian forest ecosystems.

Main areas of survey: Taiga region near Yakutsk

4) **Geochemistry Group:** Department of Sanitation and Environmental Engineering (DSEE), Hokkaido University; Geochemistry Laboratory, Permafrost Institute; and Department of Cryolithology and Glaciology, Moscow State University.

Main objectives: Monitoring of atmospheric aerosols and emissions of methane from taiga.

Main areas of survey: Near Tiksi and Yakutsk.

(5) **Atmospheric Methane Monitoring Group:** Center for Global Environmental Research (CGER) (Tsukuba) and the Permafrost Institute.

Main objective: Monitoring of atmospheric methane concentration.

Main areas of surveys: Near Tiksi and Yakutsk. The program is planned for three years.

A group of specialists will meet in Japan in winter 1992–93 for further analyses and discussions of the investigations. An international symposium is planned to be held in either Yakutsk or Sapporo in 1995. Other Japanese participants involved are S. Yoshida (ILTS), N. Takahashi (Botanical Gardens, FRI), S. Ohta (DSEE), and G. Imone (CGER).

Further information on the joint program can be obtained from Professor Fukuda.

Prepared by Masami Fukuda, Hokkaido University

RUSSIA

Several anniversaries were commemorated in Yakutsk on November 1, 1991. Fifty years of systematic permafrost research investigations and the 30th anniversary of the Permafrost Institute of the Siberian Division of the Academy of Sciences were celebrated at a special session. Greetings and congratulations were presented by Academician Koptjug of the Siberian Division of the Academy and by representatives of the Yakutian Republic. A research station was first organized in Yakutsk by the Academy in 1941. This followed the discovery in 1940 of a large supply of underground water under the frozen ground of central Yakutia. In 1956, the station became the North-East Department of Moscow's Obruchev Institute. In 1957-58, geocryological and glaciological research were carried under the International Geophysical Year at a special high-mountain station considered to be the Cold Pole of the Northern Hemisphere. In 1960-61, the Permafrost Institute was formed and Pavel Ivanovich Melnikov became its permanent director. The research of the Institute dealt with permafrost and its effects on construction, mining, agriculture and other human activi-

ties in the North. In 1969 Academician Melnikov organized the first international field excursion to Yakutia, thus making it feasible to host, in Yakutsk, the Second International Conference on Permafrost in 1973. The work of the Institute has attained international recognition. Results of fundamental field and experimental investigations on thermokarst, thermal-erosion and heat exchange were used in the development of northern and central Yakutia. Many geocryological, landscape, and hydrogeological maps were prepared by the Institute. Recently the Institute has begun participation in the study and monitoring of the cryolithosphere in connection with global climate change. These topics were presented in *Frozen Ground* No. 10, and result in part from the recommendations of the Intergovernmental Panel on Climate Change and its Working Group II on Impacts Assessment. Academician Melnikov has played a leading role in developing the report on cryosphere.

Report by N.A. Grave, Secretary
Russian National Permafrost Committee

USA

The IPA activities in the United States are supported by several organizations and individuals. Financial contributions for the annual IPA fees are provided directly to the IPA Secretary General. Thus far in 1992, contributors include:

- Association of American Geographers (AAG)
- American Society of Civil Engineers (ASCE)
- American Society of Mechanical Engineers (ASME)
- Golder&Associates, Bucky Tart, Anchorage, Alaska
- Streamborn Environment, Bill and Douglas Lovell, Berkeley, California

In addition, several government agencies are providing valuable indirect support of IPA activities, including the Cold Regions Research and Engineering Laboratory (CRREL) and the U.S. Geological Survey (USGS). The National Science Foundation has awarded the University of Colorado a grant to provide travel assistance to U.S. authors to attend the Sixth International Conference on Permafrost. The U.S. National Academy of Sciences is hosting the IPA Council meetings in Washington, D.C., in August 1992.

Current membership on the U.S. Committee for IPA includes Bill Lovell, Chairman (Purdue University); Bernard Hallet, Vice Chairman (University of Washington); Ed Link, Secretary (CRREL); George Gryc (USGS), Bucky Tart (Golder&Associates and ASCE liaison). Other liaison members are John Zarling (University of Alaska) for the ASME and Ron Abler from the National Research Council (NRC) and its Board on Earth Sciences and Resources.

The ASCE Technical Council on Cold Regions Engineering (TCCRE) recently announced the decision to expand the scope of the former "Committee on Control and Prevention of Frost Action" to include the consideration of permafrost. The reconstituted committee will be the "Committee on Frozen Ground." This decision resulted from an in-depth study by a TCCRE Task Force following the announcement of the NRC's Polar Research Board to discontinue activities of its long-standing Committee on Permafrost. Gary Guymon is the chairman of the newly designated committee. Members of the Task Force were Howard Thomas, David Esch, Frank Sayles and Bucky Tart. Additional information can be obtained from Gary

Guymon, Department of Civil Engineering, University of California-Irvine, Irvine, California 92717.

The NRC's Transportation Research Board Committee on Frost Action (A2L04) met on January 13, 1992, in Washington, D.C., during the TRB Annual Meeting. The Committee is chaired by Tom Kinney, Shannon and Wilson and University of Alaska, Fairbanks. The Committee sponsored and cohosted two sessions at the Annual Meeting entitled "Pavement performance during freezing and thawing" and "Physical and chemical aspects of soil freezing." During the Committee meeting presentations were given on the thermal impact of a chilled buried gas pipeline at high-way crossings, the Minnesota Road Research Project, the Seasonal Monitoring Program of the TRB's Strategic Highway Research Program (SHRP), and the newly formed Permafrost Technology Foundation in Fairbanks. The Committee periodically reviews research needs associated with freezing and thawing and plans to publish these findings in 1993.

David Esch, currently at the SHRP, reports that a pilot program to evaluate monitoring instrumentation is underway at sites in New York and Idaho. The instrumentation includes five types of soil moisture probes, two temperature measurements systems, an electrical soil resistance frost depth gauge and a water level monitor. Several designs of Time Domain Reflectometry (TDR) probes are included in the evaluation. The results of the pilot project will be utilized at 64 monitoring sites throughout North America. Additional information can be obtained from SHRP, 818 Connecticut Avenue, NW, 4th Floor, Washington, DC 20006 (Fax 202 223 2875).

The Institute of Arctic and Alpine Research, University of Colorado, Boulder, hosted the 22nd Arctic Workshop and the International Workshop on Classification of Circumpolar Arctic Vegetation March 5-7, 1992. A series of special sessions on the National Science Foundation's new program, Paleoclimate of Arctic Lakes and Estuaries (PALE), reported recent results from throughout the Arctic. The Vegetation workshop re-

sulted in a series of resolutions, including the decision to prepare a circumpolar vegetation map of the Arctic. Initial results from the new Synthetic Aperture Radar (SAR) satellite were presented for an area in northern Alaska at which hydrological and active layer measurements have been obtained for the past five or more years. Copies of the abstract volume may be still available from INSTAAR, Campus Box 450, University of Colorado, Boulder, Colorado 80309-0450.

Bruce Molnia, US Geological Survey, reports the following permafrost activities of the USGS in the Arctic and Alaska. Precision borehole temperature measurements and analysis continue in Northern Alaska. In addition, six automated climate-monitoring stations were installed in 1991 to provide surface energy parameters for further analyzing the permafrost temperature changes. A gas hydrate project is focused on identifying favorable locations for testing gas-hydrate production schemes, examining the flux of methane in permafrost regions and documenting hydrate-related problems associated with oil and gas drilling and production. In a coastal erosion study in northeast Alaska observations reveal a major change in rates of erosion and accretion in the last 200 years. A continuing study in Northern Alaska of the warm period observed between 9000 and 10,000 years ago may provide a possible high latitude analog for future warming scenarios. Additional information on these activities and on other U.S. government research in the Arctic is reported in the journal *Arctic Research of the United States* (available from the National Science Foundation, DPP, Room 620, Washington, D.C. 20550).

In May 1992 the U.S. and Russia renegotiated their agreement on Cooperation in the Field of Environmental Protection. One program under the joint memorandum is Area X: Arctic and Subarctic Ecosystems. Included are several permafrost activities related to oil and gas development and data and mapping. Dr. Jerry Brown is the co-chair of Area X and can provide additional information.

Report by Jerry Brown

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MISCELLANEOUS

IGCP Project 253, Termination of the Pleistocene

The Working Group for Subproject Changes in Permafrost Conditions met in Tallinn, Estonia, June 8–13, 1992. Two main topics were discussed: 1) investigation of buried glacier ice and permafrost in glaciated areas and 2) the termination of the Pleistocene in permafrost areas. A special session was planned on isotopic methods in permafrost research. The meeting was organized by the coordinator of the IGCP Subproject,

Rein Vaikmae, and additional information can be obtained from Dr. Vaikmae at the Institute of Geology, Estonian Academy of Sciences, 7 Estonia Avenue, 200105 Tallinn, Estonia. Additional information on other Project 253 activities can be obtained from the project leader: Jan Lundqvist, Department of Quaternary Research, University of Stockholm Odengatan 63, S-11322, Stockholm, Sweden (Fax 46-8-309612).

Southern African Permafrost Group

Plans are underway to establish the Southern African Permafrost Group during the July 1992 meeting of the Southern African Association of Geomorphologists (SAAG). It is anticipated that this SAAG specialist group would request membership in the IPA. Individuals involved in organizing the Group are Kevin Hall,

Jan Boelhouwers, Ian Meiklejohn, Pat Hanvey, Stefan Grab, Paul Sumner, Pierre Couture, Colin Lewis, Johann Visser, Margaret Marker and several post doctorals from the University of Western Cape. Additional information will be presented to the IPA Council in August 1992.

MAB Northern Sciences Network (NSN)

The Arctic Center of the University of Lapland hosts the Unesco MAB Northern Sciences Network. The NSN produces an informative newsletter two times a year. IPA has been providing the newsletter informa-

tion on its activities. If you are interested in receiving the NSN newsletter contact the Arctic Center, University of Lapland, P.O. Box 122, SF-96101 Rovaniemi, Finland (Fax 358 60-324777).

14th Polar Libraries Colloquy

The Polar Libraries Colloquy met at the Byrd Polar Research Center at the Ohio State University, Columbus, Ohio, May 3–7, 1992. Several related IPA activities were presented; a poster illustrating the circum-arctic permafrost map and revised legend with an annotated map bibliography and a paper on permafrost information and data management of the National Snow and Ice Data Center (Boulder, Colorado). Representatives from nine countries, all of whom are

IPA members, attended the Colloquy. A proceedings volume will be available from the Byrd Polar Research Center. On behalf of the Colloquy, the Alaska State Library publishes and distributes the Polar Libraries Bulletin two times a year. Individuals or your libraries can be placed on the mailing list by contacting Kay Shelton, Alaska State Library, P.O. Box 110571, Juneau, Alaska, 99811-0571 (Fax 907-465-2665).

International Tundra Experiment (ITEX)

The International Tundra Experiment is a coordinated international program to assess the effects of temperature warming on arctic and alpine plant populations by using a network of northern, circumpolar sites which are beyond altitudinal and latitudinal treelines.

It is organized under the Unesco Man and the Biosphere Programme and its Northern Sciences Network. At each ITEX site a basic, common experiment will be performed to observe the effects of increased growing season temperatures. Soil warming experi-

ments are being developed. Standard climate and soil observations are obtained. Since many of the sites are underlain by permafrost or have active periglacial conditions, IPA and its members may wish to collaborate with ITEX and to establish additional sites. For

more information and to receive the ITEX newsletter and manuals, contact the ITEX Secretariat, Danish Polar Center, Hauser 3, DK-1128, Copenhagen K, Denmark (Fax 45-33-134976).

International Arctic Science Committee (IASC)

The International Arctic Science Committee held its Council meeting in Reykjavik, Iceland, April 27-29, 1992. Just prior to the meeting IASC convened a planning workshop to develop a Regional Research Programme in the Arctic on Global Change. Although no

permafrost person attended, IPA has been keeping the IASC secretariat advised of its activities. For additional information on these IASC activities and to receive its newsletter contact: IASC Secretariat, P.O. Box 158, 1330 Oslo Airport, Norway.

FROST '93

The International Symposium on Frost in Geotechnical Engineering will be held June 28–July 1, 1993, in Anchorage, Alaska. The symposium is jointly organized by the University of Alaska–Anchorage, the ISSMFE Technical Committee TC8:FROST, the ASCE Technical Council on Cold Regions Engineering, and the IPA Working Group on Seasonal Freezing and Thawing of Permafrost Areas.

The themes of the symposium are: theory pertaining to prediction of frost penetration and thermal degrada-

tion of the frozen layer, design and construction of structures against frost, and case histories illustrating frost damage and remedial measures. Abstracts (500 words in length) are due August 1, 1992. Prospective authors and participants can obtain additional information from Arvind Phukan, School of Engineering, University of Alaska–Anchorage, 3211 Providence Drive, Anchorage, Alaska 99508-8096. Participants are encouraged to continue their travels to Beijing following the symposium in order to attend the IPA Sixth International Conference on Permafrost.

First International Conference on Cryopedology

The Conference Cryosols: The Effects of Cryogenesis on the Processes and Peculiarities of Soil Formation will be held in Pushchino (Moscow), Russia, November 10–14, 1992. The Conference is jointly organized by the Institute of Soil Science and Photosynthesis, the Scientific Council of Earth Cryology, the All-Union Society of Soil Science and the Interna-

tional Society of Soil Science. The program includes many topics of interest to permafrost specialists. Information can be obtained from David Gilichinsky, Laboratory of Soil Cryology, Institute of Soil Science and Photosynthesis, Russian Academy of Sciences, Pushchino, Moscow Region, 142292, Russia (Telex 205128 SOIL SU).

JOURNALS AND BOOKS



PERMAFROST AND PERIGLACIAL PROCESSES

Volume 2, Issue No. 4 (October–December 1991)

- Introduction—Cryogenic Weathering*; K. Hall and J.-P. Lautridou
- A Model of the Rate of Frost Shattering: Application to Field Data from Japan, Svalbard and Antarctica*; N. Matsuoka
- Weathering by Segregation Ice Growth in Microcracks at Sustained Subzero Temperatures: Verification from an Experimental Study Using Acoustic Emissions*; B. Hallet, J.S. Walder and C.W. Stubbs
- Frost Heave Mechanism in Welded Tuff*; S. Akagawa and M. Fukuda
- Rock Properties as Controls on Free-Face Debris Fall Activity*; G.R. Douglas, W.B. Whalley and J.P. McGreevy
- Rock Moisture Data from the Juneau Icefield (Alaska) and Its Significance for Mechanical Weathering Studies*; K. Hall
- Evidence for Enhanced Mechanical Weathering Associated with Seasonally Late-Lying and Perennial Snow Patches, Jotunheimen, Norway*; M.S. Berrisford

Short Communications

- The Contribution of W.R.B. Battle to Mechanical Weathering Studies*; W.B. Whalley and J.P. McGreevy
- Frost Weathering of Rocks in the Presence of Salts—A Review*; R.B.G. Williams and D.A. Robinson

Volume 3, Issue No. 1 (January–March 1992)

- Changes in Microstructure of Fine-Grained Soils Due to Freezing*; S.E. Grechishchev, A.V. Pavlov and V.V. Ponomarev
- A Solifluction Meter for Permafrost Sites*; A.G. Lewkowicz
- Hydrogen and Oxygen Isotopes and the Origin of the Ice in Peat Plateaus*; S.A. Harris, I.H. Schmidt and H.R. Krouse
- Dynamics of Rock Glaciers of the Northern Tien Shan and The Djungar Ala Tau, Kazakhstan*
- Microrelief on a Rock Glacier—Dalton Range, Yukon, Canada*; P.G. Johnson

Short Communications

- La Gélivation des Parois Rocheuses dans une Glacière du Jura Neuchatelois*; A. Pancza

- Holocene Periglacial Processes and Environmental Changes in Daqinghsan Mountains, Inner Mongolia, China*; Cui Zhijiu and Song Changqing
- Small-Scale Patterned Ground, Comeragh Mountains, Southeast Ireland*; P. Wilson

Volume 3, Issue No. 2 (January–March 1992)

- Proceedings of International Workshop on Permafrost and Periglacial Environments in Mountain Areas: Inter-laken (16–20 September 1991)*

Part 1: Situation Reports

- Prospecting and Mapping of Mountain Permafrost and Associated Phenomena*; L. King, A.P. Gorbunov and M. Evin
- Distribution of Mountain Permafrost and Climate*; Cheng Guodong and F. Dramis
- Permafrost Creep and Rock Glaciers*; D. Barsch
- Interactions and Relations Between Mountain Permafrost, Glaciers, Snow and Water*; S. Harris and A.E. Corte
- Construction, Environment Problems and Natural Hazards in Periglacial Mountain Belts*; W. Haerberli

Part 2: Short Communications

- Borehole Logging in Alpine Permafrost, Upper Engadin, Swiss Alps*; D.S. Vonder Mühlhll and P. Holub
- Automated Mapping of Mountain Permafrost Using the Programme PERMAKART and with the GIS ARCI-INFO*; F. Keller
- A Model of Potential Direct Solar Radiation for Investigating Occurrences of Mountain Permafrost*; M. Funk and M. Hoelzle
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Ten Years of Surficial Velocities on a Rock Glacier (Laurichard, French Alps); B. Francou and L. Reynaud
Creep of Alpine Permafrost Investigated on the Murtèl Rock Glacier, Swiss Alps; S. Wagner
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Environmental Limits of Needle Ice: The USSR Survey; A. Gorbunov and E. Yermolin
The Geochemical Paradox of Ice Complex Sediments in Northern Siberia; V. Konishchev and I. Plakht

Regularities in Formation and Paleographic Importance of Isotope-Oxygen Composition of Ground Ice in the Subarctic; V. Solomatin and M. Konyakhin
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Microbiological Markers in Permafrost; D. Gilichinsky
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Role of Vegetation Cover in Cryolithic Zones; M. Moskalenko

Ground Freezing 91

The Proceedings of the Sixth International Symposium on Ground Freezing, edited by Yu Xiang and Wang Changsheng, are available in two volumes from

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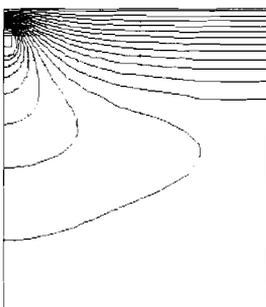
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Calendar of Recent and Forthcoming Meetings

1992

Eleventh Offshore Mechanics and Arctic Engineering Conference

7–11 June 1992, Calgary, Alberta, Canada

Contact: ASME, Dept. OAE92A, 22 Law Drive, Fairfield, New Jersey 07007-2900
Fax: (201) 882-5155

Termination of Pleistocene Working Group Meeting (Project 253): Changes in Permafrost Conditions

8–13 June 1992, Tallinn, Estonia

Contact: Rein Vackniae, Estonian Academy of Sciences, 7 Estonia Avenue, 200105 Tallinn, Estonia
Fax: 7-0142-444-189

Second (1992) International Offshore and Polar Engineering Conference

14–19 June 1992, San Francisco, California, U.S.A.

Contact: Jin C. Chung, ISOPE, P.O. Box 1107, Golden, Colorado 80402-1107
Phone: (303) 273-3673; Fax: (303) 420-3760

2nd International Symposium on Mining in the Arctic

19–22 July 1992, Fairbanks, Alaska

Contact: Dr. Sukumar Bandopadhyay, Department of Mining and Geophysical Engineering, University of Alaska, Fairbanks, Alaska 99775-1190
Phone: (970) 474-6876; Fax (907) 474-6635

Permafrost and Periglacial Environments in Mountain Areas—International Workshop

1–3 August 1992

Pre-Workshop Field Trip: Permafrost and Periglacial Landforms, Mountains of Southwest Alberta
27–31 July 1992

Post-Workshop Field Trip: Periglacial Features in the Northern Rocky Mountains of the U.S.A.
4–7 August 1992

Contact: S.A. Harris, Department of Geography, University of Calgary, Alberta T2N 1N4, Canada
Phone: (403) 720-5584

IGU Pre-Congress Field Trip

1–7 August 1992, Indian Peaks, Colorado, U.S.A.

Contact: Colin Thorn, Dept. of Geography, University of Illinois, 607 South Mathews 220, Urbana, Illinois 61808, U.S.A.

IPA Council Meetings

6–8 August 1992, Washington, D.C., U.S.A.

Contact: J. Ross Mackay, IPA Secretary General, Department of Geography, #217 1984 West Mall, University of British Columbia, Vancouver, BC V6T 1Z2, Canada
Phone: (604) 822-2257 or 2663; Fax: (604) 822-6150

27th Congress of the International Geographical Union

9–14 August 1992, Washington, D.C., U.S.A.

Contact: Anthony R. de Sousa, Secretary-General, 27th International Geographical Congress, 1145 17th Street NW, Washington, D.C. 20036, U.S.A.
Phone: (202) 828-6688; Fax: (202) 775-6141
Telex: 64194

IGU Post-Congress Field Trip: Paleoperiglacial Environments in Mountain Areas

14–18 August 1992, Central Appalachians, U.S.A.

Contact: G. Michael Clark, Department of Geological Sciences, 306 G&G Building, University of Tennessee, Knoxville, Tennessee 37996-1410, U.S.A.
Phone: (615) 974-2366; Fax: (615) 974-2368

AMQUA 1992 Biennial Meeting

21–30 August 1992, Davis, California, U.S.A.

Contact: Bob Bettinger, University of California (Davis), Davis, California 95616

29th International Geological Congress

24 August–3 September 1992, Kyoto, Japan

Contact: Secretary General, ICG-92, PO Box 65, Tsukuba, Ibaraki, 305, Japan.
Phone: 81-298-54-3627, Fax: 81-298-54-3629.

9th International Northern Research Basins Symposium and Workshop

14–21 August 1992, Whitehorse, Dawson, Inuvik, Canada

Contact: Terry Prowse, National Hydrology Research Centre, 11 Innovation Boulevard, Saskatoon, Saskatchewan, S7N 3H5, Canada
Phone: (306) 975-5737; Fax: (306) 975-5143

International Conference on Arctic Margins (ICAM)

2–4 September 1992, Anchorage, Alaska, U.S.A.

Contact: Dennis Thurston or David Steffy, 1992 ICAM, Alaska Geological Society, P.O. Box 101288, Anchorage, Alaska 99510
Phone: (907) 271-6545 (Thurston) or 6553 (Steffy)
Fax: (907) 271-6805

**Symposium on Snow and Snow-Related Problems
(part of an International Forum on Snow Areas)
14–18 September 1992, Nagaoka, Japan**
Contact: Secretary General, International Glaciological Society, Lensfield Road, Cambridge, CB2 1ER, United Kingdom
Phone: 223-355974; Fax: 223-336543

**23rd Annual Binghamton Geomorphology
Symposium: Geomorphic Systems
25–27 September 1992, Oxford, Ohio, U.S.A.**
Contact: William H. Renwick, Department of Geography, Miami University, Oxford, Ohio 45056
Phone: (512) 529-1362

**1st Circumpolar Agricultural Conference:
Opportunities in Diversity to Meet Global Change
28 September–2 October 1992, Whitehorse, Yukon,
Canada**
Contact: David Berkman, Territorial Government, 103-302 Steele Street, Whitehorse, Yukon Y1A 2C5, Canada
Phone: (403) 668-7663; Fax: (403) 633-3067

**45th Canadian Geotechnical Conference
26–28 October 1992, Toronto, Ontario, Canada**
Contact: Dr. Balu Iyer, Ministry of Transportation of Ontario, 1201 Wilson Avenue, Room 315, Central Building, Downsview, Ontario, M3M 1J8, Canada
Phone: (416) 235-3731; Fax: (416) 235-5240

**International Conference on Cryopedology
10–14 November 1992, Pushchno, Moscow Region,
U.S.S.R.**
Contact: Secretariat, Institute of Soil Science and Photosynthesis, U.S.S.R. Academy of Sciences, Pushchno, Moscow Region, 142292, U.S.S.R.
Phone: 7-095-923-35-58; Telex: 205128 SOIL SU

1993

**Circum-Pacific Council for Energy and
Mineral Resources
Symposium on Arctic Resources: The Challenge
of Development
24–26 May 1993, Anchorage, Alaska**
Contact: Donald P. Blasko, U.S. Bureau of Mines, 3301 "C" Street, Suite 525, Anchorage, Alaska 99503-3935
Phone: (907) 271-2455; Fax: (907) 271-3933

**3rd (1993) International Offshore and Polar Engineering
Conference
6–11 June 1993, Singapore**
Contact: ISOPE, P.O. Box 1107, Golden, Colorado 80402-1107
Phone: (303) 273-3673; Fax (303) 420-3760

**Fourth International Symposium on Thermal Engineering
and Science for Cold Regions
16–19 June 1993, Hanover, New Hampshire**
Contact: Virgil Lunardini, USA Cold Regions Research and Engineering Laboratory, 72 Lyme Road, Hanover, New Hampshire 03755-1290
Phone: (603) 646-4326; Fax: (603) 646-4640
Telex: 710 366 1826

**International Conference on Offshore Mechanics and
Arctic Engineering
20–24 June 1993, Glasgow, Scotland**
Contact: S.K. Chakrabarti, c/o CBI Research, 1501 North Division St., Plainfield, Illinois 60544-9829
Phone: (815) 436-2912; Fax: (815) 436-8345

**4th Canadian Marine Geotechnical Conference
27–30 June 1993, St. Johns, Newfoundland, Canada**
Contact: Farrokh Poorooshasb, C-Core, Memorial University of Newfoundland, St. Johns, Newfoundland, A1B 3X5, Canada
Phone: (709) 737-8371; Fax (709) 737-4706

**International Symposium on Frost in Geotechnical
Engineering
28 June–1 July 1993, Anchorage, Alaska**
Contact: Arvind Phukan, School of Engineering, University of Alaska, 3211 Providence Drive, Anchorage, Alaska 99508-8096

**Sixth 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; Fax: 86-931-485241

**4th Meeting—Geocryology of the Americas
(IGCP Project 297)
5–9 July 1993, Beijing, China**
Contact: Arturo E. Corte, P.O. Box 330, 5500 Mendoza, Argentina
Fax: 54-61 380370; Telex: 55438 CYTME AR

**International Correlation Meeting on Permafrost-Affected
Soils: Classification, Correlation, and Management
of Permafrost-Affected Soils
18–30 July 1993, Northwest Canada and Alaska**
Contact: John Kimble, USDA-SCS, Federal Building, Room 152, 100 Centennial Mall North, Lincoln, Nebraska 68508-3866, U.S.A.
Phone: (402) 437-5363; Fax: (402) 437-5336

ICG Pre-Conference Field Trip—Geomorphology and Permafrost of the Yukon and the Western Canadian Arctic

11–22 August 1993

Contact: C.R. Burn, Department of Geography, University of British Columbia, Vancouver, British Columbia C6T 1W5, Canada

Third International Conference on Geomorphology
(including the Binghamton Symposium—25 August)

23–29 August 1993, Hamilton, Ontario, Canada

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

Phone: (416) 546 9140 X 4535; Telex: 061-8347;

Fax: (416) 546 0463

Fifth Canadian and Japanese Conference on Paving
1993, Calgary, Alberta, Canada

1994

7th International Cold Regions Engineering Specialty Conference

6–9 March 1994, Edmonton, Alberta, Canada

(additional information in next issue of *Frozen Ground*)

Polar Tech '94

22–25 March 1994, Luleå, Sweden

Contact: CENTEX, Lena Allheim Karbin, Luleå University of Technology, S-95187, Luleå, Sweden

4th (1994) International Offshore and Polar Engineering Conference (with Third Pacific/Asia Offshore Mechanics Symposium)

10–15 April 1994, Osaka/Kobe, Japan

Contact: ISOPE, P.O. Box 1107, Golden, Colorado 80402-1107

Phone: (303) 273-3673; Fax (303) 420-3760

4th International Conference on the Bearing Capacity of Roads and Airfields

July 1994, Minneapolis, Minnesota

Contact: BCRA '94, Conference Services, 338 Nolte Center, University of Minnesota, Minneapolis, Minnesota 55455-0139

Phone: (612) 625-9023; Fax (612) 626-1632

International Conference on Offshore Mechanics and Arctic Engineering

Fall 1994, Houston, Texas

International Symposium on Ground Freezing
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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 (see map)

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 12 days. Transport will be by train and bus.

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 bus.

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 are given in the First Bulletin.

The Second Bulletin will be available in December 1992.

Correspondence and Preliminary Questionnaire

All correspondence pertaining to the Conference should be addressed to:

Prof. Cheng Guodong
Secretariat for the Sixth International Conference on Permafrost
Lanzhou Institute of Glaciology
and Geocryology
Chinese Academy of Sciences
Lanzhou 730000, China
Telex: 72008 IGGAS CN
Fax: 86-931-485241

Please complete, copy and send to the Secretariat:

Name _____

Title _____

Mailing address _____

Affiliation _____

Telephone _____

Fax _____

Telex _____

I would like to join the following conference tours:

- A Qinghai-Tibet Plateau/Lhasa
B Tianshan Mountains/Ürümqi
C 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 _____

- D South and central China 1D 2D
E East China 1E 2E
 Beijing (one day during conference)

